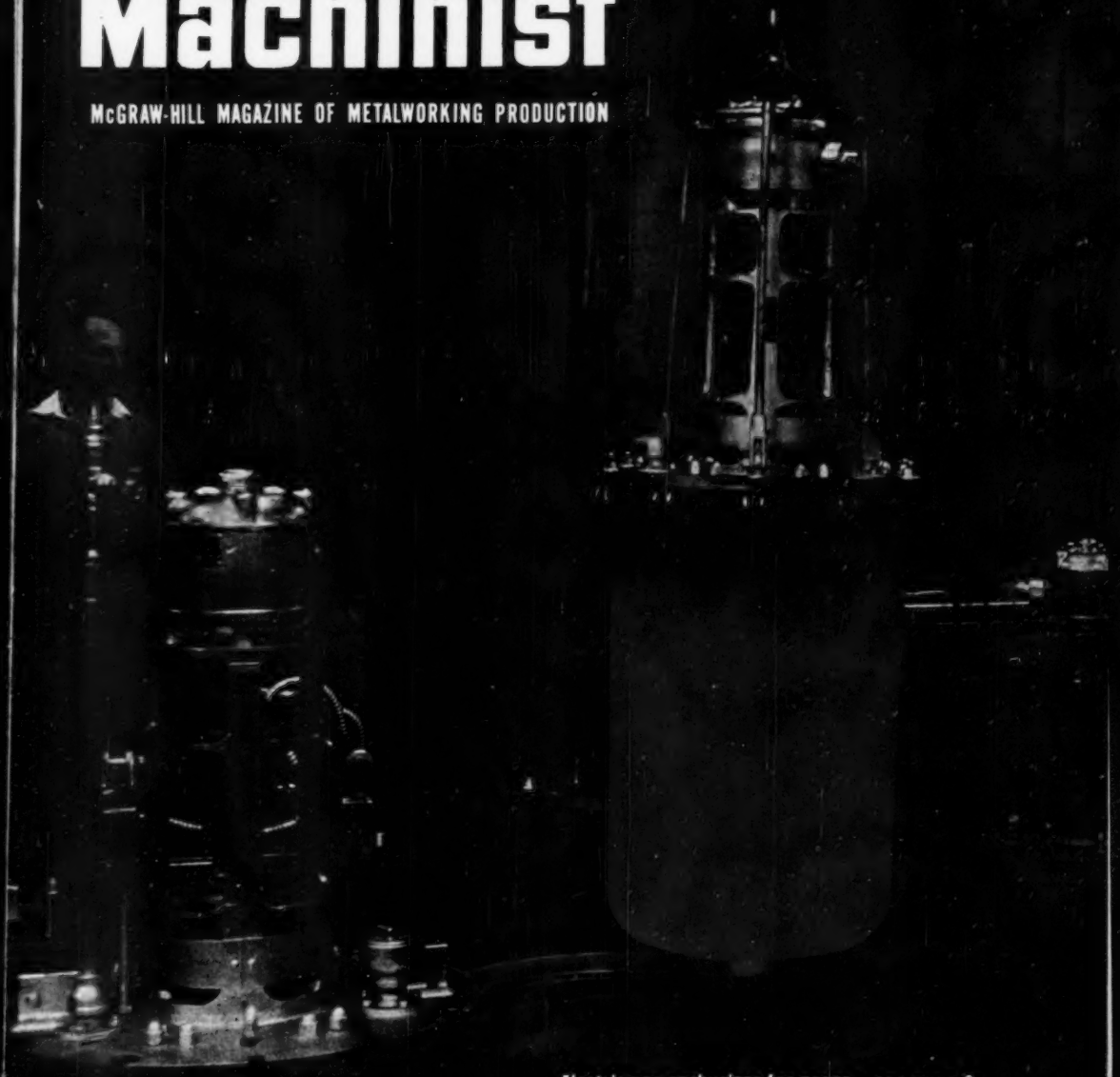
American Machinist

APRIL 7, 1949

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION



Electric gas-carburizer for gears — see *page 2*

LIGHT DRILLPRESSES ARE VERSATILE

ARE NEW M.E.'S THEORISTS?

FIXTURES FOR INDUCTION HEATING

CHANGE-OVER TIME

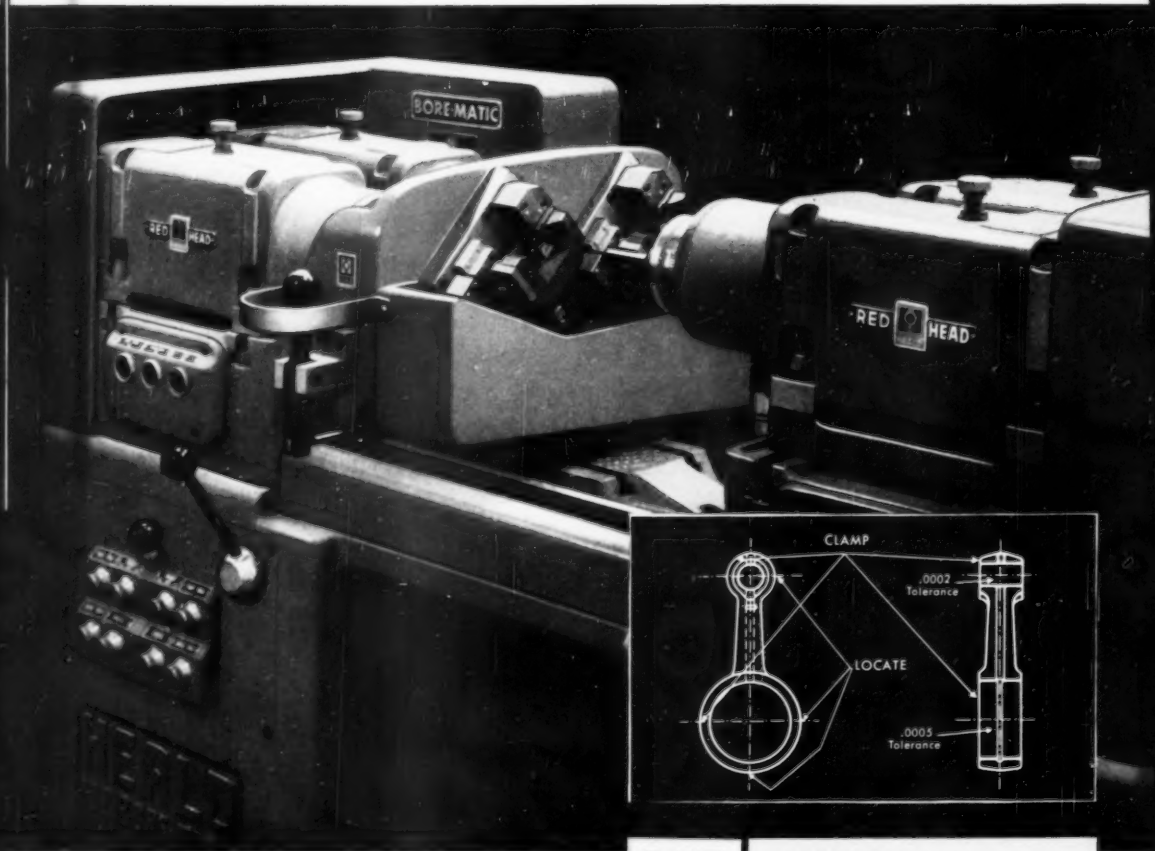
CUT 50%

Con rods produced faster on New Heald Model 122 Bore-Matic

Borizing connecting rods is a job that calls for both high precision and high production—a combination for which the new Heald machines are ideally suited. For example—

The Model 122 Bore-Matic shown below is finishing cast-iron connecting rods for a refrigerator manufacturer at the rate of 170 per hour—boring to a tolerance of .0005" at the crank end, and .0002" at the pin end. The entire machine cycle is automatic and takes only 33 seconds, with only *4 seconds* for table rapid-traverse. And "change-over" time is cut in half.

Whatever *your* product, if it calls for high-speed or high-precision borizing or grinding, there's a new Heald machine that can help you do it faster, easier, and at lower cost per part. Your nearest Heald representative will be glad to show you how.



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American Machinist

MAGAZINE OF METALWORKING PRODUCTION

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Chips and QUIPS

Our Cover . . . 1750 F makes that healthy red glow on the pot of a heavy-duty gas-atmosphere electric carburizing furnace at Sier-Bath Gear & Pump Co., Inc., Newark, N. J. The centrifugal fan mounted on the cover of the electrically heated container circulates propane gas around and through the load of gears and shafts, holding distortion to a minimum and maintaining uniform depth of case.

The Deans Debate . . . War speedup and postwar jamming of technical courses squeezed down — and in some cases *out* — the shop lab. courses that gave M.E. grads some perspective on machine tools and what they can do. Admittedly, many labs, and more courses, were archaic, but they were better than nothing — or so thought Managing Editor Tangerman. Last December, he wrote his views for publication. Several friends suggested that he send these opinions to engineering-college deans for comment *before* publication. It's hard to choke down the fear of deans, even after 20 years, but he sent out the manuscript to deans and heads of departments listed in government records, some 105. The manuscript was mailed Dec. 30, and we're still receiving replies, mostly two pages and longer. We've heard from more than 60 colleges thus far, in some cases from a half-dozen men at each. We'd like you to read all of these letters, but that would be hopeless, so we've abstracted them for five pages of lively discussion in this issue. Further, all data on courses and equipment has been compiled in tabulations at the rear of the issue. You'll want to study this special survey — it concerns you, your engineers-to-be, your sons and nephews.

Drilling . . . During and since World War II, light drillpresses, with or without their normal columns and bases, have been adapted to a variety of jobs. Associate Editor Jim Linsley, with the assistance of the makers, has put together typical examples of the unusual jobs to make our Special Report in this issue. It's in pictures, for your convenience.

Production Induction . . . Back in 1945, Associate Editor Ben Brosheer started to dig at the Tocco Division of Ohio Crankshaft for a story on high-production induction-heating setups. It took four years, but two Tocco engineers have finally gotten it together. It's in this issue, as a picture-and-caption story to speed your study of it.

Projection Fixtures . . . At International Business Machines, Endicott, N. Y., fixtures have been developed to speed inspection with J. & L. comparators. They place each piece in proper relationship to the lens system. . . . There are more fixtures in the story from N. N. Sawin of Austria, describing the machining of large interchangeable parts. . . . There's more tooling in Chester Ricker's story on manufacturing the Olds rocker arm. . . . And C. C. Roberts of Brown Instrument explains the application of an electrical conductor for stress-relieving welds made in piping.

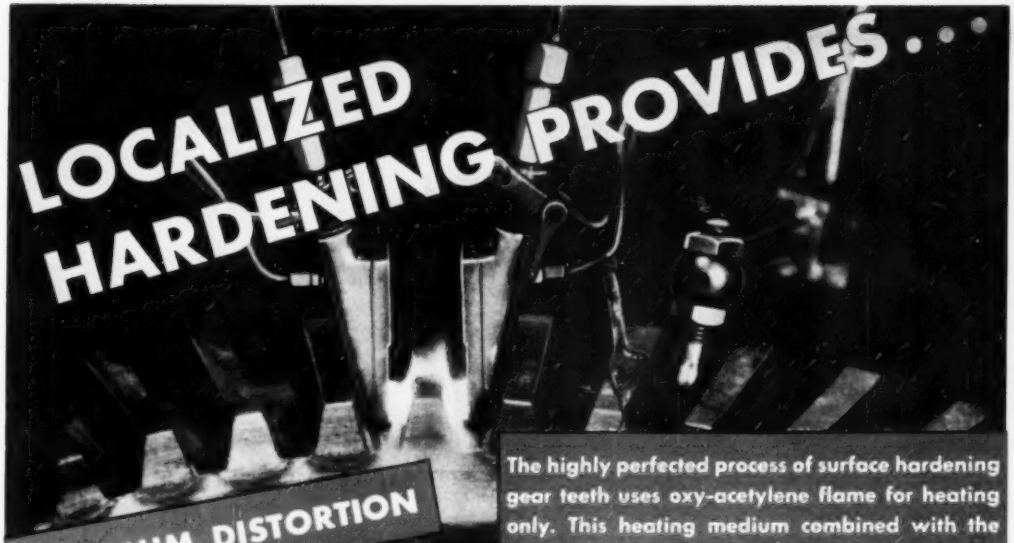
Trend of Business . . . Says L. P. Fisher, G. M. director, "I think business is better than business sentiment."

Coming . . . April 21 *A.M.* will include a Special Report on the pressroom standards just approved by the Joint Automotive Council — providing it is approved in time. We have a lead article explaining how to keep a suggestion system working, others on control of carbide inventory, odd jobs that can be done with induction heat (tool engineers and plastics men will be particularly interested in this), the multiple-casting machining methods used by Oldsmobile, and a complex progressive die. . . . The cover will picture a tremendous new planer, and there'll be other features including the usual popular departments.

ELECTRONICS SPECIALIST . . . David Fidelman, who authors our current 2-part article on heat-treat control, received his B. S. in 1939, his M. Sc. in 1940, from New York University, majoring in physics and electronic engineering. 1940-45 he was a physicist for the Naval Ordnance Lab. in Washington and Federal Telephone & Telegraph in New York, working on electronic instruments. In 1943 he taught a course for Yale on electronics. 1945-48 he was with CBS on circuit development, color television and long-playing records, applying electronics all along the line.

He has done much research on application of electronic instrumentation to industrial problems and has written a number of articles on the subject, as well as a book, "Industrial Electronics," to be published by Macmillan this Fall. For the past year, he's specialized in his pet field as a consultant with Electronic Consulting Service, N. Y. C.

LOCALIZED HARDENING PROVIDES . . .



MINIMUM DISTORTION

MAXIMUM WEAR RESISTANCE

UNIFORM HARDNESS

. . . at Low Cost

One machine with a choice of replaceable burner tips can handle a whole range of sizes and pitches of bevel, spur and internal gears.

The highly perfected process of surface hardening gear teeth uses oxy-acetylene flame for heating only. This heating medium combined with the accurate mechanical features embodied in the Gleason surface hardeners make possible surface hardening of gear teeth with absolute uniformity, including a mechanical speed-up to avoid overheating the ends of the tooth and reversal of the burner slide to pre-heat the next tooth to be hardened. Each tooth of a gear is hardened for the same length of time, to the same depth, and each gear of a production run maintains the same uniformity for quiet, smooth, durable operation.

Write for literature "Surface Hardening of Gear Teeth" for further information.

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NO. 2 SURFACE HARDENER

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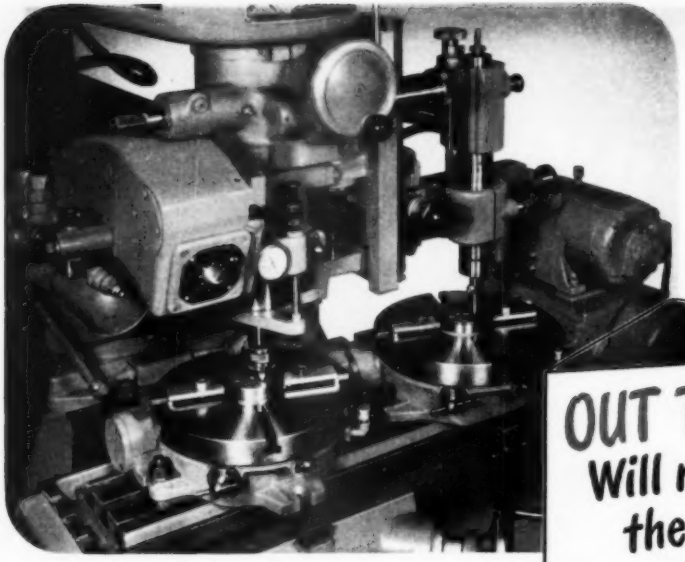
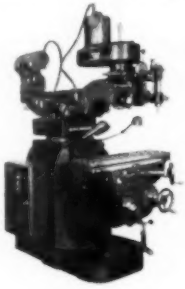
Builders of Bevel Gear Machinery for Over Eighty Years



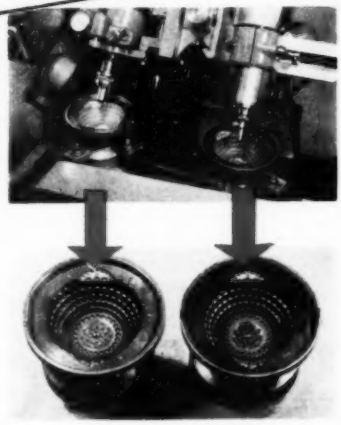
CINCINNATI 8" x 18" Tool and Die Milling Machine, equipped with Duplex Rotary Table Attachment.

OUT TO LUNCH
Will return when the die is cut

Any day now you can expect to see an "out to lunch" sign on a CINCINNATI 8" x 18" Tool and Die Milling Machine. It could actually happen—with no interruption to the cutting process—on one of these machines equipped with a Duplex Rotary Table Attachment. We know of one diemaker who set up and started the machine, went home to dinner, and then returned about three hours later just before the die was finished. ¶ This attachment is basically a pair of rotary tables, driven in unison from a single power source, and incorporating an extremely slow power driven cross feed of the saddle from the same power source. One table carries the work and the other carries the master or model. With an extremely light touch, the tracing head on the machine automatically follows the contour of the work. When once set up, the operation requires practically no attention. This equipment on a CINCINNATI 8" x 18" Tool and Die Milling Machine accurately mills intricate shapes and designs, concentric and non-concentric. Two examples are shown here. May we send you complete information about these efficient machines?



CINCINNATI 8"x18" Tool and Die Milling Machine. Ask for catalog M-1620-1.



Concentric. Glass mold rotary milled on a CINCINNATI 8"x18". The master is at the left. The setup for this job is shown above.

Non-concentric. Leather embossing die, rotary milled on a CINCINNATI 8" x 18".

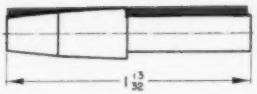
THE CINCINNATI MILLING MACHINE CO.

CINCINNATI 9, OHIO, U. S. A.

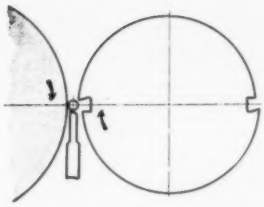
MILLING MACHINES • BROACHING MACHINES • CUTTER SHARPENING MACHINES
FLAME HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

HOW TO INFEED GRIND 1200 parts per hour

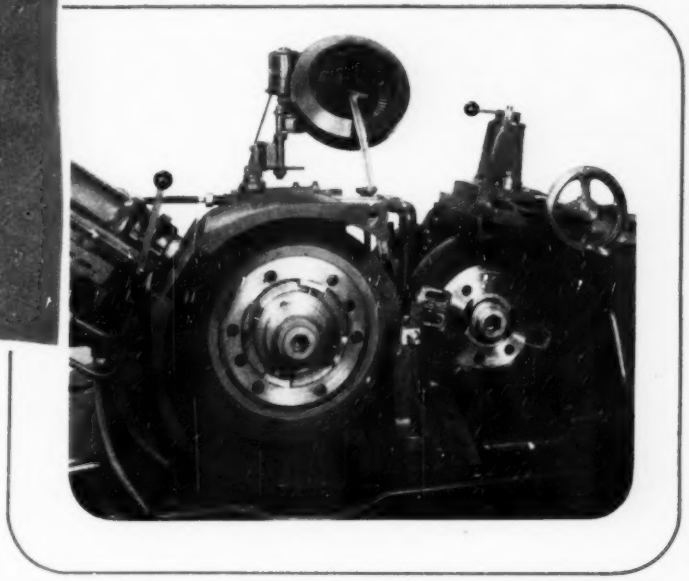
without moving the infeed slide



Drawing of the part FILMATIC Centerless ground on the equipment illustrated below.
Part name.....feed tip
Material.....hard rubber
Operation.....profile grind
Stock removal.....from solid
Production.....approx. 1200 per hour
Equipment..CINCINNATI FILMATIC No. 2 Centerless, tooled up by Cincinnati Application Engineers



This drawing illustrates the principle of rotary infeed grinding on a CINCINNATI FILMATIC Centerless.



In this illustration guards have been removed to show setup for rotary infeed grinding operation on CINCINNATI FILMATIC No. 2 Centerless Grinder.

Nearly everyone is familiar with reciprocating motion produced by rotating cams or eccentrics. Cincinnati Engineers applied this basic principle of mechanics to centerless grinding, *not to produce reciprocating motion, but to eliminate it.* The regulating wheel is trued to a single, or as in this example, a double cam shape (see drawing). As it rotates, a part inserted at either point of minimum radius is forced against the grinding wheel by an amount equal to the "rise" of the cam trued sector of the wheel. Spaces in the wheel permit the parts to be loaded and ejected.

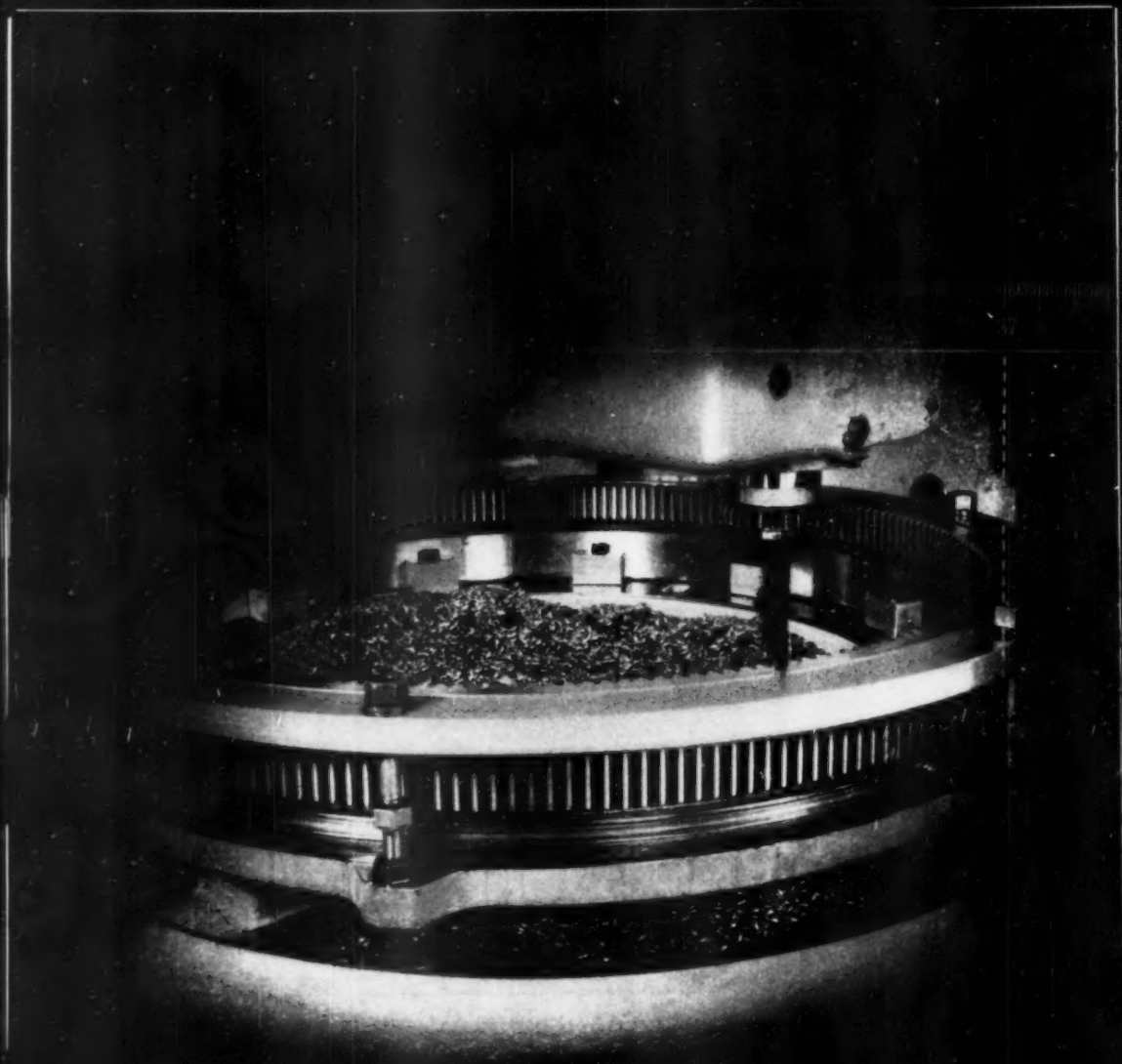
The CINCINNATI FILMATIC No. 2 Centerless illustrated above employs this rotary infeed principle to eliminate reciprocating motion of the slides, while accurately grinding two parts each revolution of the regulating wheel. Production rate, 1200 per hour.

To keep pace with the machine, a hopper feed attachment is included with this type of equipment. A truing unit, designed specifically for rotary infeed grinding operations, trues the regulating wheel to the desired shape. ¶ CINCINNATI FILMATIC Centerless Grinders, equipped for rotary infeed grinding, offer exceptionally low costs to many high production industries. Can you employ this technique? Our Application Engineers will help you explore the possibilities. When writing, you will save time by including sequence of operations and blueprint of part.

CINCINNATI GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

CENTER TYPE GRINDING MACHINES • CENTERLESS LAPPING MACHINES • CENTERLESS GRINDING MACHINES



GEAR SHAPERS
SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS

PLASTICS MOLDING MACHINES

New Mastery of Costs on BIG GEARS

Here is a new Fellows machine . . . the 36-inch Gear Shaper . . . the rigid construction of which permits the taking of heavier cuts that set a new production pace, and a new and lower standard of costs in gear cutting.

A case in point is the large combined external and internal gear illustrated. Feeds as high as .0225" per stroke at 58 strokes per minute prove the ability of this machine to take fast, heavy, roughing cuts. A study of the tabulation below should whet the interest of those seeking to lower their costs in gear cutting.

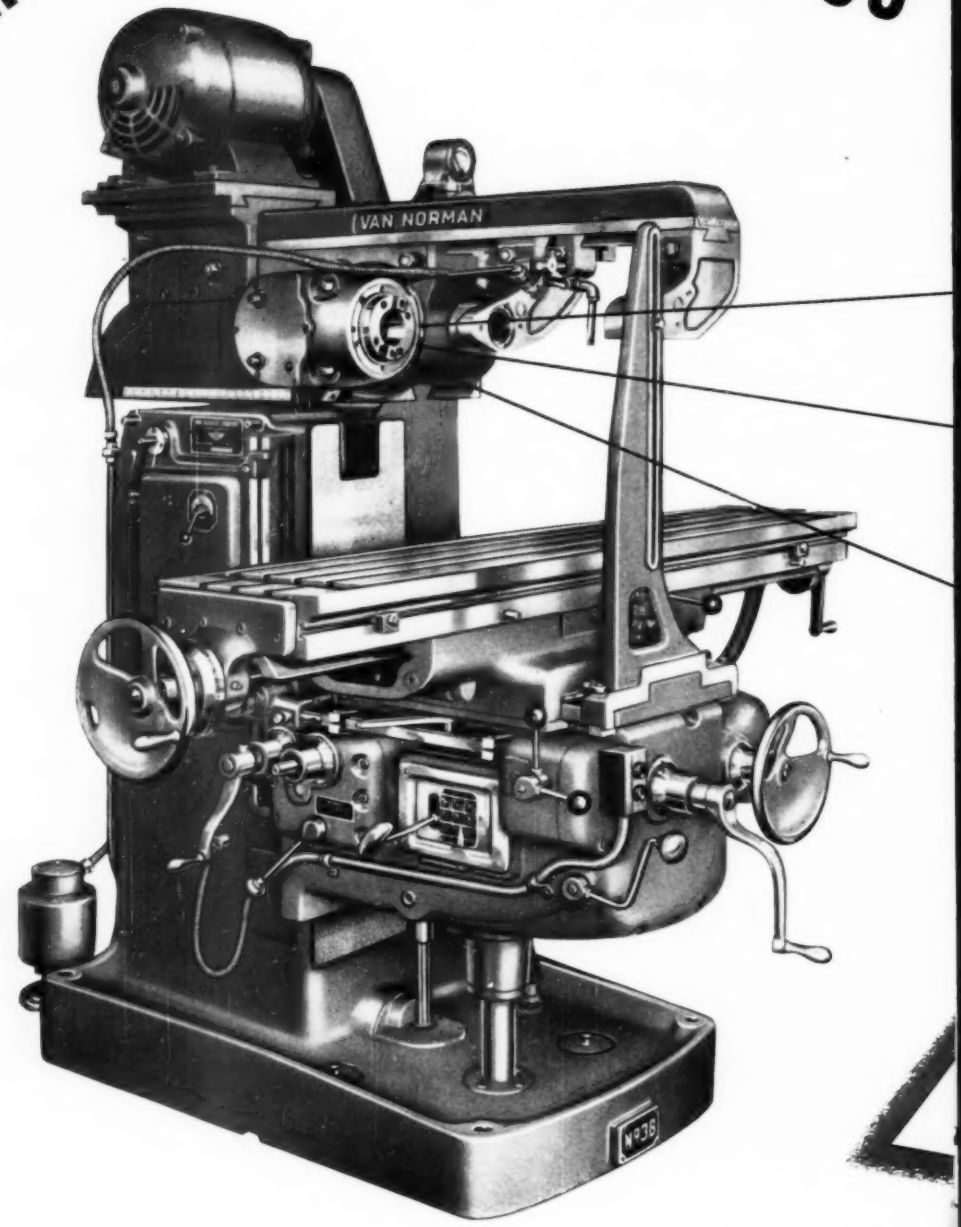
	External Gear	Internal Gear
Material	SAE 3250 52 R-C	SAE 3250 52 R-C
Pitch diameter (inches)	37.166	34.666
No. of teeth	223	208
Diametral pitch	6	6
Pressure angle	20°	20°
Face width (inches)	2¼	1¾
Roughing cut (58 strokes per min.)	.0225" per stroke	.0225" per stroke
Finish cut (58 strokes per min.)	.027" per stroke	.027" per stroke (66 STROKES PER MINUTE)
TOTAL PRODUCTION TIME	2 hrs. 48 min. 45 sec.	2 hrs. 15 min.

We have even more data to offer in evidence of the remarkable production possibilities of the 36-inch Gear Shaper. Call or write our nearest office.

Fellows

THE FELLOWS GEAR SHAPER COMPANY • Head Office and Export Department • 78 River Street, Springfield, Vermont.
Branch Offices: 616 Fisher Bldg., Detroit 2 • 640 West Town Office Bldg., Chicago 12 • 7706 Empire State Bldg., New York 1.

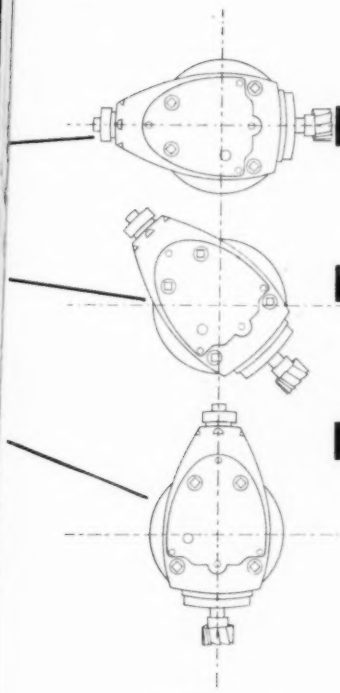
The New Van Norman No. 38



Ram Type Miller

Meets All Milling Requirements

FROM HORIZONTAL TO VERTICAL

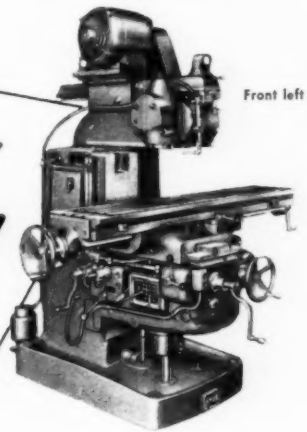


HORIZONTAL Position and lock the cutterhead in horizontal location and you are ready to perform conventional horizontal milling using standard arbors and cutters.

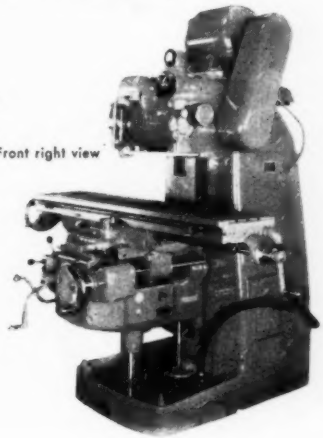
ANGULAR For angular milling set cutterhead in desired angular position, set-up the work and begin milling. Graduated dial makes proper angle positioning easy.

VERTICAL Set cutterhead in vertical position, or 90° on the dial, and the No. 38 becomes a vertical miller.

This rugged Van Norman No. 38 has a 10 hp motor to the cutterhead with spindle speeds up to 2000 rpm . . . a speed instantly available for every type of cut. Write for details today.



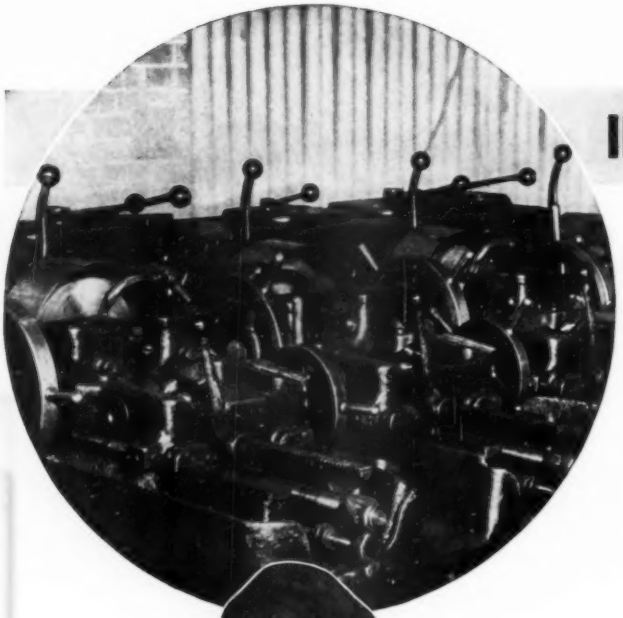
Front left view



Front right view

Van Norman Company

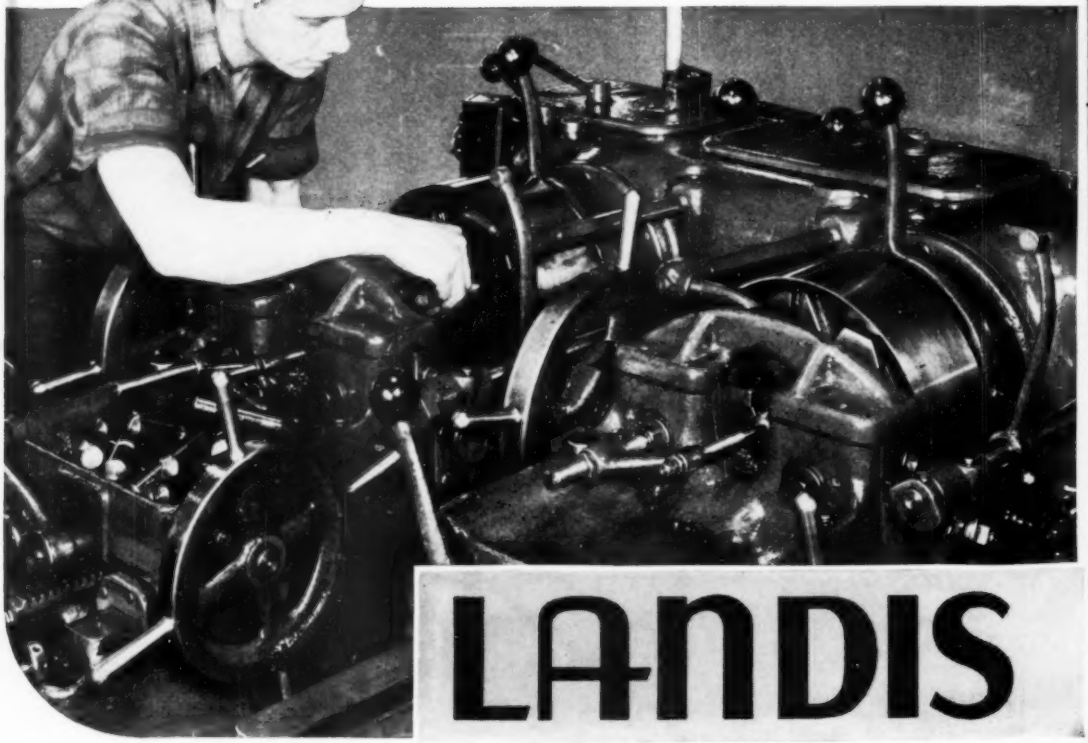
SPRINGFIELD 7, MASSACHUSETTS



IN SINGLE, DOUBLE &

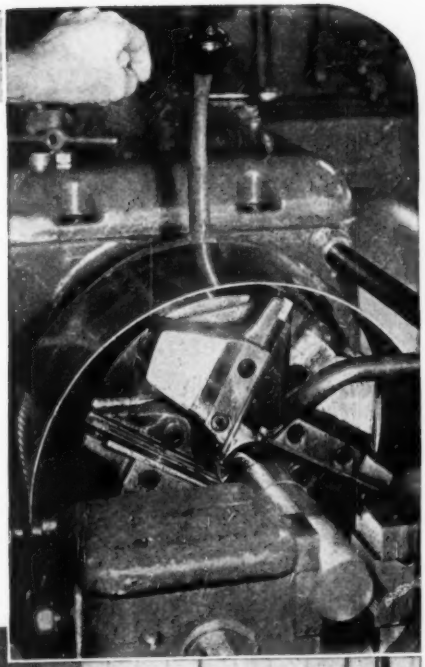
The LANDMACO Threading Machines are productive precision tools capable of economically handling many threading operations heretofore done by slower and more expensive threading methods.

The many features of these machines combine to assure great accuracy, ease of operation, and flexibility in making set-up changes. Every possible provision has been made to minimize or compensate for any wear that might affect their efficiency or



LANDIS

QUADRUPLE HEAD MODELS



accuracy. The Quadruple Head machine can be used efficiently for cutting long threads on bolts, rods, staybolts, etc. For jobbing or maintenance work, each spindle can be set for a separate diameter and pitch, eliminating frequent set-up.

Regularly equipped with the LANCO Head and the Landis Tangential Chasers, LANDIS Reverse Taper Heads can be supplied as special equipment for threading taper head crown bolts.

Write for Bulletin H-75

MACHINE CO. WAYNESBORO PENNA. U.S.A.

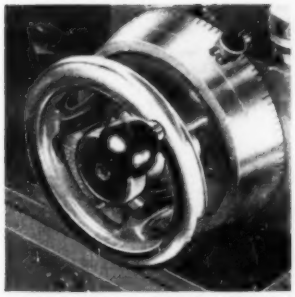
BETTER SIGHT / MORE WORK with

LANDIS TOOL
Precision Grinders

EQUIPPED WITH MICROSPHERE BEARINGS

Let us send you our new 28-page condensed catalog so that you can see for yourself how the eye level wheel feed and other exclusive features contribute to the accuracy, fine finish and production advantages of LANDIS TOOL Precision Grinders.

LANDIS TOOL EYE LEVEL wheel feed



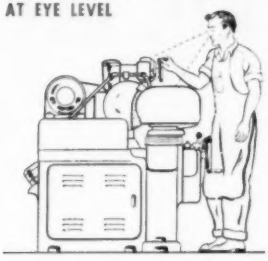
LARGE EASY-TO-READ GRADUATIONS AT EYE LEVEL

eye

level

wheel

feed



OPERATOR CAN WATCH GRINDING ACTION WHILE FEEDING WHEEL

An operator can do more work when he can watch the grinding action while feeding the grinding wheel. With LANDIS TOOL Universal Precision Grinders you can feed the wheel and watch the grinding action without turning your head. Operator fatigue is reduced. Seeing is believing. We invite you to make your own test on a LANDIS TOOL Universal Grinder.

features of LANDIS TOOL Hydraulic Universal Grinders

1. MICROSPHERE WHEEL SPINDLE BEARINGS
2. EYE LEVEL WHEEL FEED
3. HYDRAULIC OPERATION
4. VARIABLE SPEED HEADSTOCK
5. RAPID HYDRAULIC WHEEL POSITIONING
6. SWINGING INTERNAL FIXTURE

LANDIS TOOL COMPANY / WAYNESBORO, PENNA.

WESTINGHOUSE ANNOUNCES THE NEW ALL-ALUMINUM PRECIPITRON*... MOST EFFICIENT AIR CLEANER EVER BUILT

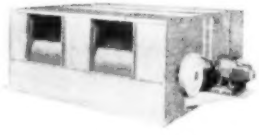
Now PRECIPITRON is more effective than ever!* Introduced more than ten years ago by Westinghouse, PRECIPITRON*, the electronic air cleaner, has opened important new avenues of cost reduction for business and industry. For only the PRECIPITRON* principle eliminates up to 90% of all airborne dirt, smoke, dust, soot and industrial oil mists, compared to the 10% to 20% efficiencies of ordinary mechanical filters.

The new, all-aluminum PRECIPITRON* cell now offers more advantages that mean additional savings—

1. **25% More Plate Area Per Cell.** Means lower costs for cleaning a given volume of air. For, each PRECIPITRON* Dust Collector Cell has 25% more collection area than before. This permits more compact installation with resultant savings in space and equipment.
2. **All-Aluminum Construction.** Means lower maintenance and installation costs. For, as the only electronic air

*Reg. U. S. Pat. Off.

REFRIGERATION CONDENSERS



AIR HANDLING UNITS

UNIT HEATERS

25% MORE PLATE AREA per cell

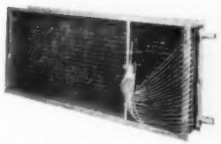
cleaner with aluminum frames as well as cells and ionizers, PRECIPITRON* has an exceptionally high resistance to corrosion and rust—needs no protective coating. And, there's not a single part—with exception of power pack—which cannot be handled by one man without auxiliary lifting devices. Heaviest piece weighs only 50 lbs. So, PRECIPITRON* is assembled quickly, easily—with resultant savings in labor costs.

For more information on this new PRECIPITRON* and how it can significantly cut dirt-caused losses in *your* business or industrial operations, call your nearest Westinghouse office. Or, write to Westinghouse Electric Corporation, Sturtevant Division, Hyde Park, Boston 36, Massachusetts.

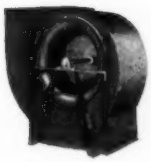
Westinghouse
Sturtevant Division

REFRIGERATION COMPRESSORS

AXIAL FLOW FANS

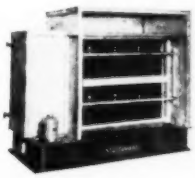


HEATING AND COOLING COILS



CENTRIFUGAL FANS

UNIT AIR CONDITIONERS

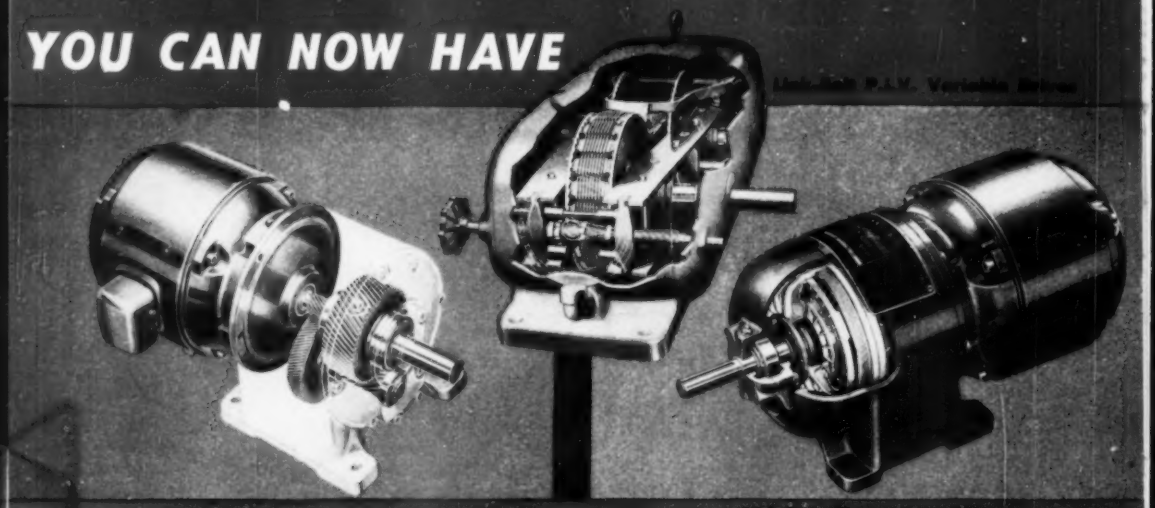


SURFACE DEHUMIDIFIERS

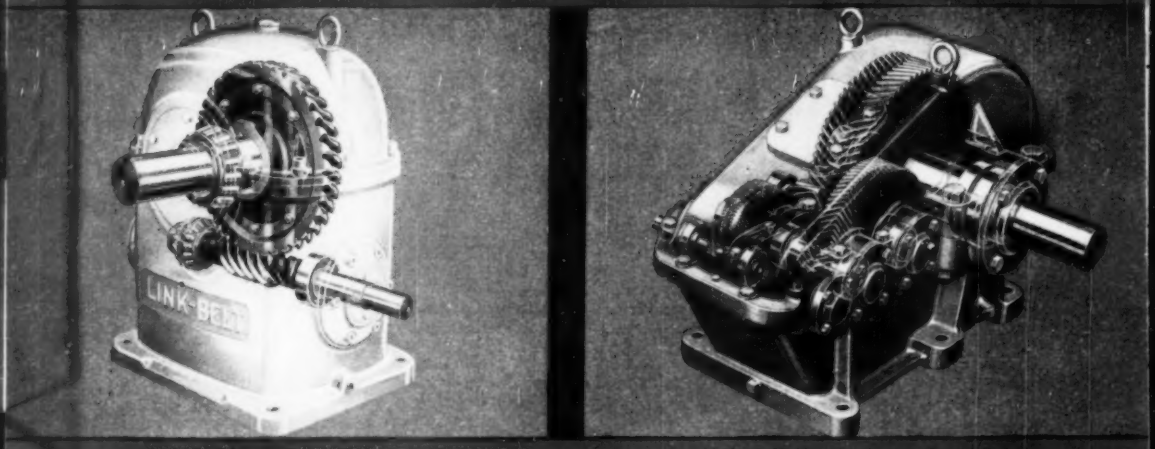
Everything that puts air to work for Every application

J-80134

YOU CAN NOW HAVE



IMMEDIATE DELIVERY ON



LINK-BELT ENCLOSED DRIVES

YOU can push production by using dependable, efficient Link-Belt Drives. The added efficiency of the proper drives for speed reduction, speed variation or other power transmission is available to you *at once*. Because Link-Belt manufactures a complete line, you can rely upon the unbiased advice of a Link-Belt Engineer as to the proper drive for your particular need. For prompt and reliable service, please call our nearest office.

LINK-BELT COMPANY Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Dallas 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8. Offices, Factory Branch Stores and Distributors in Principal Cities.

11,410

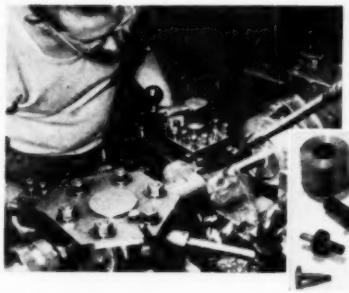
LINK-BELT

Power Transmission Machinery

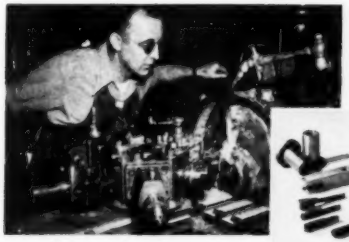
"THE COMPLETE LINE"

PRODUCE 1 to 12 PIECES *profitably* ON TURRET LATHES

THE O. M. EDWARDS CO., INC., of Syracuse, N. Y., makes accurate parts for trapdoors, retractable steps, and double glazed windows they supply for modern railroad equipment. Lots of 1 to 10 pieces are usually routed to Warner & Swasey turret lathes. In addition to reduction in setup time, they have noted a 43% production increase on all jobs—large or small—run on their No. 3 Warner & Swasey.



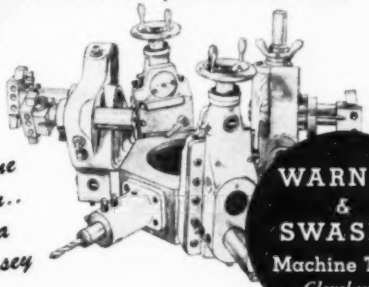
THE NYE-WAITE COMPANY of Auburn, N. Y., is alert to all improvements in carpet-making machinery. The Machinery and Repair Division builds the special machines needed. Scores of different jobs of less than 10 pieces are common, some of 1 or 2 pieces. A Standard Tooling setup on their No. 3 Warner & Swasey reduces setup time so these small-lot jobs can be machined profitably.



THE MORSE CHAIN COMPANY, a Division of Borg-Warner Corporation of Ithaca, N. Y., manufactures mechanical power transmission equipment. They use Warner & Swasey No. 3, No. 4, 1-A, 2-A, 3-A, and 4-A turret lathes to handle a large variety of small lots—1 to 12 pieces in each. Morse Chain solved the problem of producing small-lots profitably so well that they now use a No. 4 Warner & Swasey in their tool room.

STANDARD TOOLING SETUPS
Most shops find they can do more jobs faster on Warner & Swasey Turret Lathes with Standard Tooling Setups. It permits multiple and combined cuts, with shorter setup time for profitable production increases.

Standard Tooling Setups and the right tools which can help you increase your output are all covered in the new 194 page Warner & Swasey Tool Catalog. Write for your copy.



You can machine it better, faster.. for less with a Warner & Swasey

WARNER & SWASEY
Machine Tools
Cleveland

TURRET LATHES, MULTIPLE & SINGLE SPINDLE AUTOMATICS, PRECISION TAPPING AND THREADING MACHINES

YOU CAN GRIND FOR LESS

When You're Using the *Right* Wheel on Each Job

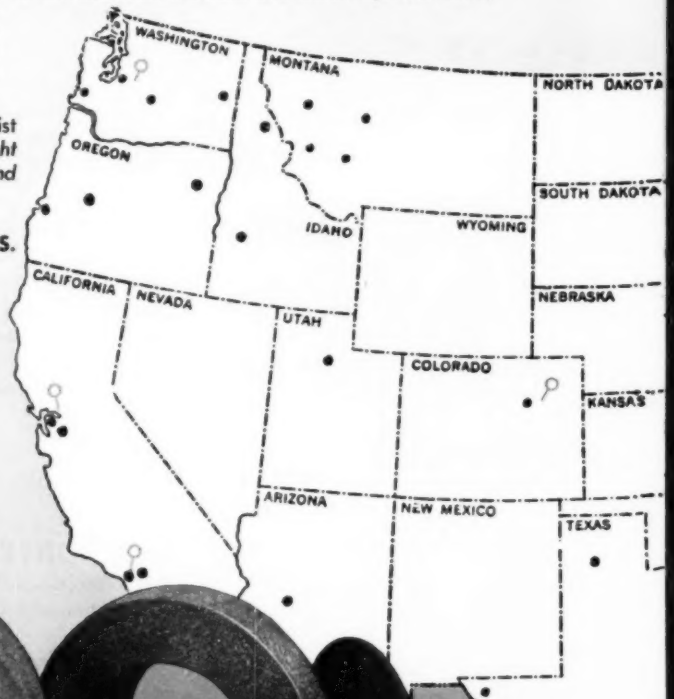
And it's easy to use the *right* grinding wheel—the economical wheel—when you're buying Norton. Here's why:

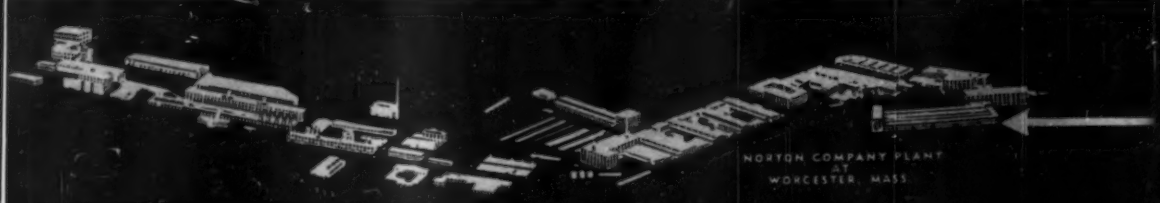
1. ***The completeness of the Norton line***—The wide variety of types of Norton wheels, the many abrasives and bonds, the wide range of grains, grades and structures—they make it possible to provide a wheel with the correct grinding action for ***each job*** in your plant.

2. ***The country-wide Norton engineering service***—It's not enough to have the right wheels—they must be correctly selected for your grinding jobs. There are Norton abrasive engineers in every industrial center—highly skilled men who know how to solve your grinding problems. Back of them is the Worcester staff with its experts in various types of grinding. And supplementing the Norton field force are the abrasive specialists of Norton distributors—men who have been factory-trained at Worcester so that they really know grinding wheels.

Let a Norton engineer or a distributor's specialist select from the complete Norton line the *right* wheel for each of your grinding jobs. *You'll find that you really can grind for less.*

NORTON COMPANY, WORCESTER 6, MASS.





NORTON GRINDING WHEELS
Are Handy to You

In over 200 cities from coast to coast there are Norton distributors with grinding wheels on their shelves—many with thousands of wheels.

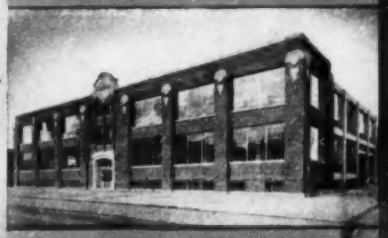
Back of them in five strategic locations, are the Norton warehouses illustrated at the right—staffed and stocked for prompt service.

And back of them there's the Norton factory stock at Worcester of over 3,000,000 grinding wheels—backed in turn by the manufacturing facilities of the world's largest grinding wheel plant.

NORTON ABRASIVES

NORTON WAREHOUSES

CHICAGO



CLEVELAND

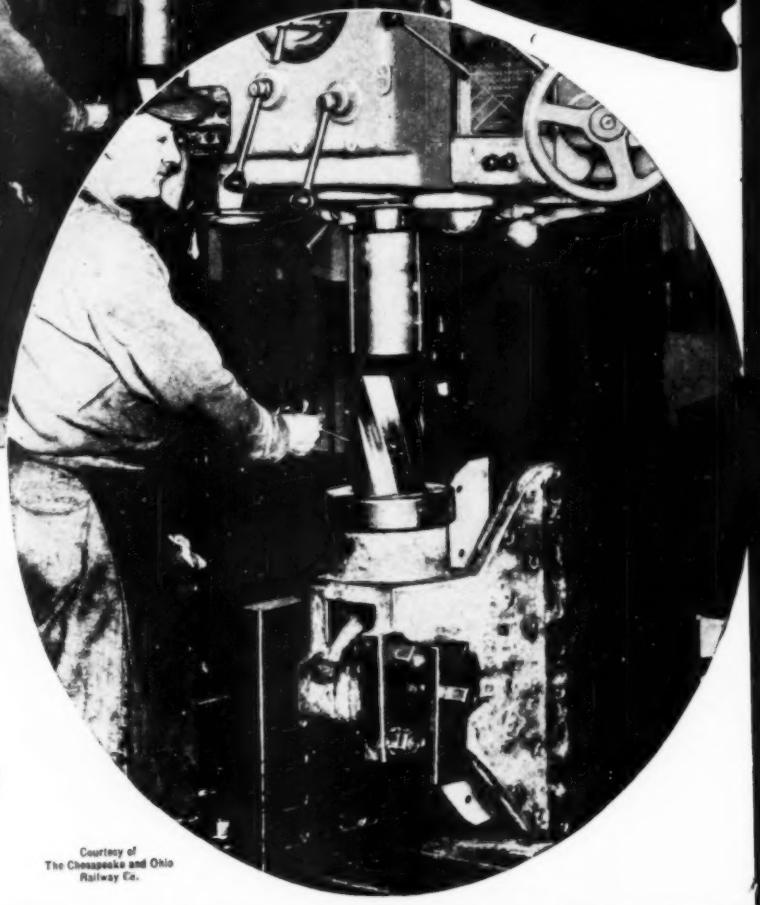
PHILADELPHIA

DETROIT

PITTSBURGH

This newest Worcester unit, with a floor space of nearly five acres, is now in operation—producing vitrified grinding wheels by a new process, a process which makes them to new standards of precision in size, balance and grinding action.

The



Taper reaming locomotive cross heads for piston rod fits.

Courtesy of
The Chesapeake and Ohio
Railway Co.

THE AMERICAN TOOL WORKS CO.

Acid Test of SPINDLE CONSTRUCTION

Reaming cross heads for piston rod fits is about the toughest job you can find for a radial drill spindle.

This work must be done at slow speeds, without chatter and with a fine finish.

IT'S A TOUGH ONE BUT—

1 **The boring mill construction of the "American" Hole Wizard Spindle does the job. Its 100% anti-friction design with adjustment for wear insures frictionless operation and maintenance of original accuracy.**

2 **The patented Double Lo-Hung Spindle Drive locates the large diameter driving gear at the bottom of the head close to the work, thus minimizing spindle torque.**

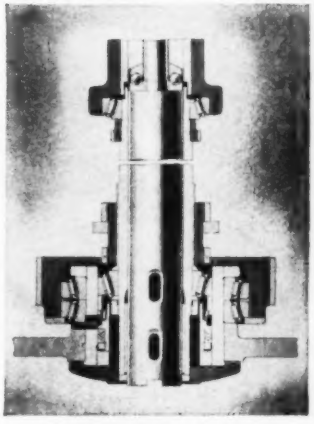
3 **The large diameter spindle, recently increased to add 37% to its rigidity, easily resists the enormous torsional effort imposed by this job.**

4 **Spindle shake is reduced to an absolute minimum by allowing only .00025" freedom between the ground nitrided spindle and the honed nitrided spindle sleeve. This is especially valuable on accurate boring operations.**

These four spindle characteristics are YOUR assurance that YOUR tough ones will be done easier, quicker and cheaper with an "American" Hole Wizard on the job.

Civilian goods and services must be produced in greater quantities and at lower costs. The "American" Hole Wizard Radial definitely is a contributor to this cause.

Patented Double Lo-Hung Spindle Drive.



Patented Double Lo-Hung anti-friction spindle mounting.

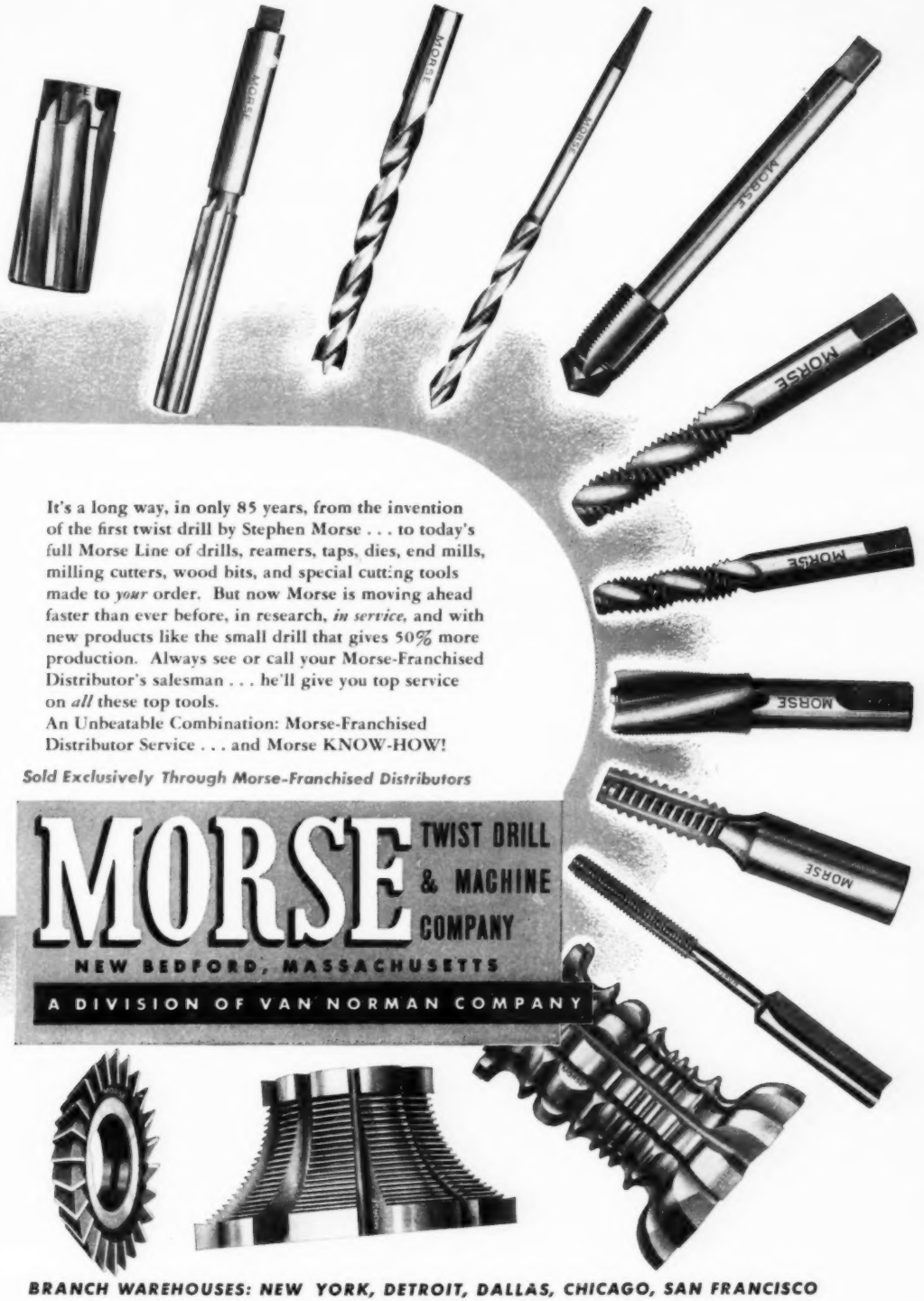
BULLETIN 327 TELLS THE STORY . . . YOURS FOR THE ASKING

Lathes and Radial Drills **Cincinnati, Ohio U.S.A.**

YOUR MORSE-FRANCHISED DISTRIBUTOR

Can Supply All your Tool Requirements—

Watch the May issues for CONTEST WINNERS! (Best names for New Drill)



It's a long way, in only 85 years, from the invention of the first twist drill by Stephen Morse . . . to today's full Morse Line of drills, reamers, taps, dies, end mills, milling cutters, wood bits, and special cutting tools made to *your* order. But now Morse is moving ahead faster than ever before, in research, *in service*, and with new products like the small drill that gives 50% more production. Always see or call your Morse-Franchised Distributor's salesman . . . he'll give you top service on *all* these top tools.

An Unbeatable Combination: Morse-Franchised Distributor Service . . . and Morse KNOW-HOW!

Sold Exclusively Through Morse-Franchised Distributors

MORSE TWIST DRILL & MACHINE COMPANY

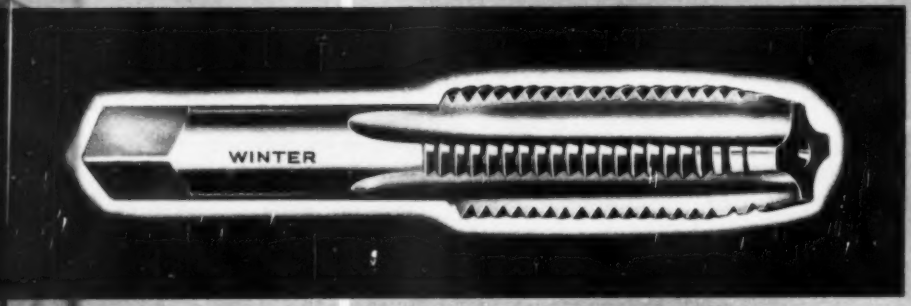
NEW BEDFORD, MASSACHUSETTS

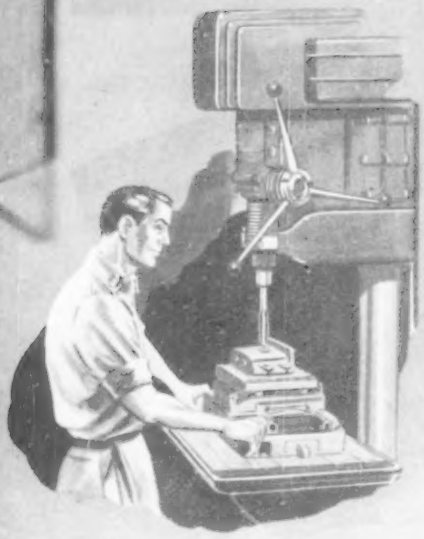
A DIVISION OF VAN NORMAN COMPANY

BRANCH WAREHOUSES: NEW YORK, DETROIT, DALLAS, CHICAGO, SAN FRANCISCO

WINTER

TAPS IN ACTION





In hundreds of plants throughout the country, WINTER HAND TAPS are producing accurate tapped holes and saving their users money.

Three styles are available, individually or in sets: taper style, plug style, and bottoming style.

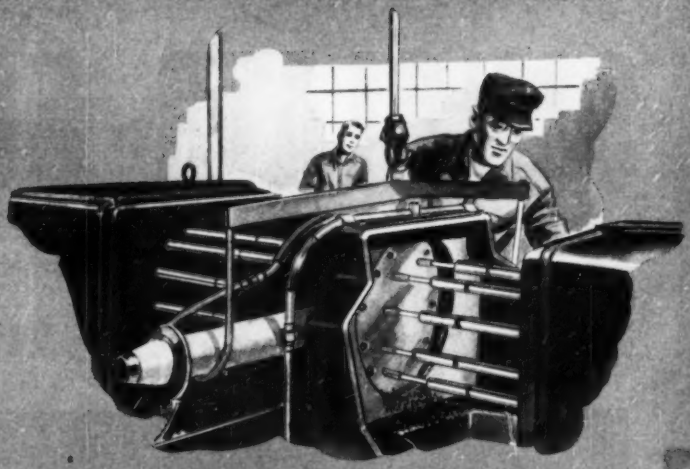
WINTER standard hand taps are supplied with cut thread in carbon or high speed steel, and with commercial ground or precision ground thread in high speed steel.

In addition, WINTER offers a complete line of taps and dies, including chip driver, machine screw, nut, pipe, pulley, stove bolt, and tapper taps.

ALWAYS AT YOUR SERVICE

YOUR LOCAL DISTRIBUTOR carries a complete stock of Winter taps on his shelves—as close to your tapping problems as the telephone on your desk.

WINTER BROTHERS COMPANY • Division of the National Twist Drill and Tool Company
Rochester, Michigan, U. S. A. Distributors in Principal Cities • Branches in New York, Detroit, Chicago, San Francisco



NATIONAL CUTTING TOOLS ON THE JOB

Where holes must be finished to size with minimum chatter, NATIONAL SPIRAL FLUTED CHUCKING REAMERS have proven themselves on the job.
They maintain their size because of special design and heat treatment. Besides spiral fluted chucking reamers, NATIONAL offers hand, straight flute chucking, shell, taper pin, center, and special reamers.
NATIONAL also manufactures a complete line of rotary metal cutting tools, including twist drills, milling cutters, counterbores, end mills, hobs, and special tools.

CALL YOUR DISTRIBUTOR

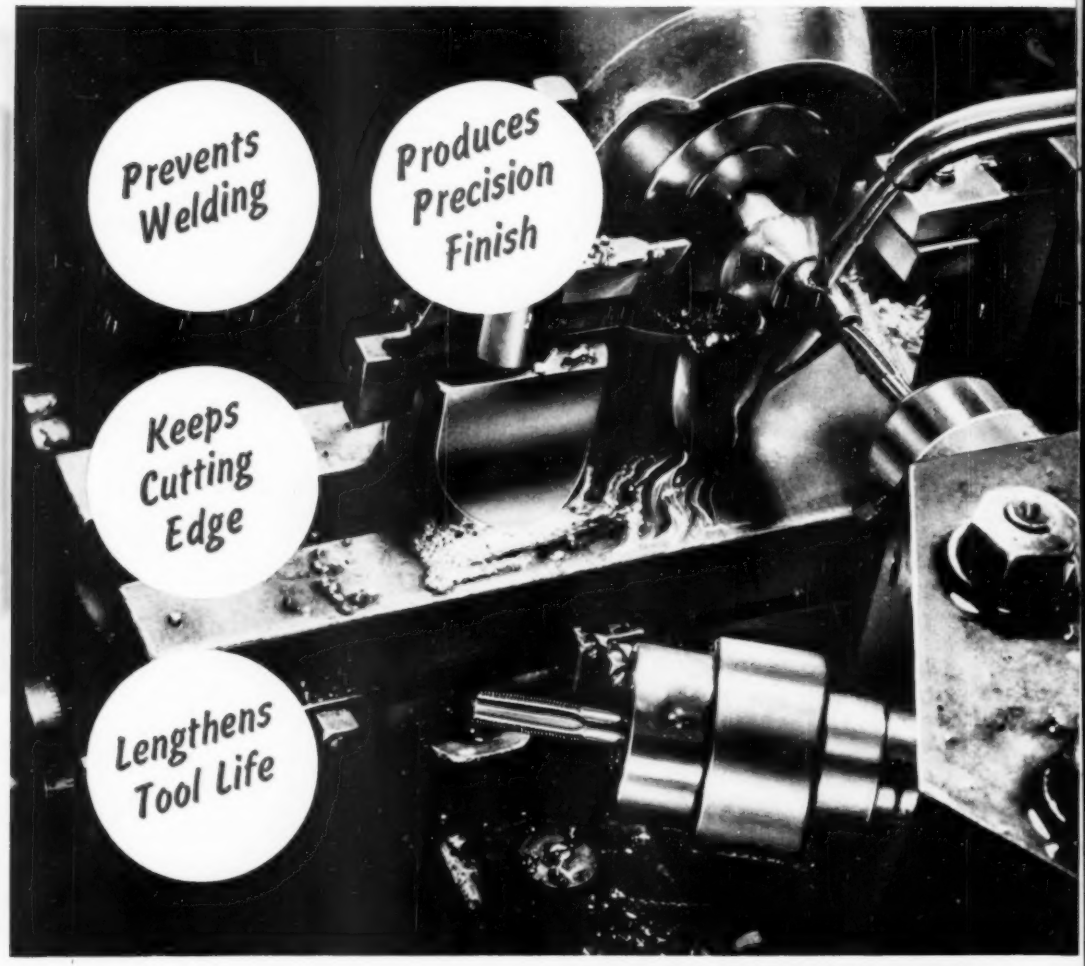
LEADING DISTRIBUTORS EVERYWHERE offer complete stocks of NATIONAL cutting tools. Call them for cutting tools or any other staple industrial product.

NATIONAL TWIST DRILL & TOOL CO. ROCHESTER, MICH. U.S.A.

National

NATIONAL TWIST DRILL AND TOOL COMPANY • Rochester, Michigan, U.S.A.
Distributors in Principal Cities • Factory Branches: New York • Chicago • Detroit • Cleveland • San Francisco

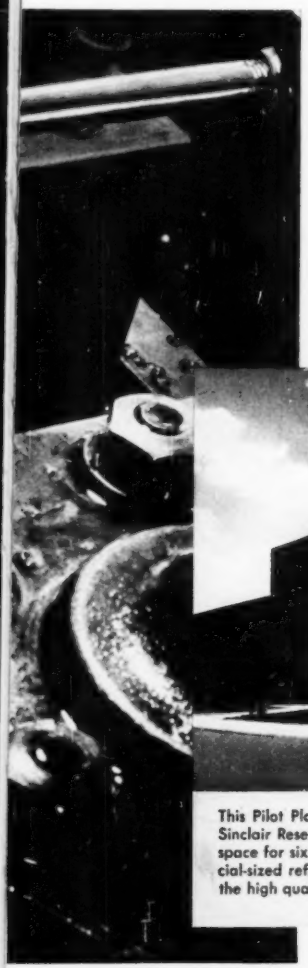
SINCLAIR AUTOKUT and Lengthens Periods



SINCLAIR

YOUR NEAREST SINCLAIR AGENT WILL GLADLY ARRANGE

Masters Tough Steels Between Grinds



Hard-to-cut steels are a problem in the production plant. They are hard on tools and make frequent changing necessary. This means loss of costly man and machine hours.

Sinclair AUTOKUT meets the challenge of tough steels. Specially compounded, AUTOKUT is built for severe service in difficult operations such as threading, tapping and heavy-duty broaching. AUTOKUT prevents welding at the tool point to maintain an effective cutting edge and to insure production of more perfect pieces of work per grind. To turn out piece after piece of uniform finish and to lengthen periods between grinds, try Sinclair AUTOKUT.

This Pilot Plant, part of the new multi-million dollar Sinclair Research Laboratory at Harvey, Ill., provides space for six miniature operating replicas of commercial-sized refinery units. Continuous research explains the high quality of AUTOKUT and other Sinclair Oils.

Making a study of crystal structure of catalysts, this Sinclair researcher at Harvey uses physical chemistry to develop refinery techniques in a never ending effort to bring industry better petroleum products at lower costs.

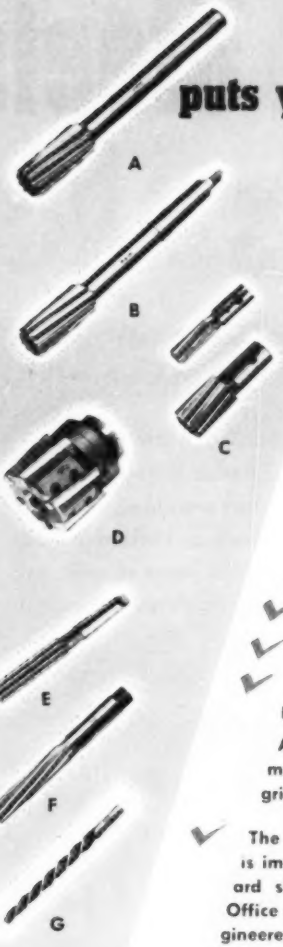
INDUSTRIAL OILS

FOR LUBRICATION COUNSEL, OR YOU MAY WRITE TO SINCLAIR REFINING COMPANY, 630 FIFTH AVE., NEW YORK 20, N. Y.

Pratt & Whitney

puts you on the Right Route to Efficient

REAMING RESULTS



Experience-proved, performance-tested P&W Reamer Design includes . . .

- ✓ **Proper flute design**
- ✓ **Correct type and amount of relief**
- ✓ **Close diameter tolerance**

This results in **free-cutting Reamers producing smooth, accurate holes.**

* * *

P&W metallurgical control includes:

- ✓ **Quality of steel**
- ✓ **Special hardening process**
- ✓ **Long-life surface hardening treatment**

Plus **excellent grinding finish**

All are features which guarantee the maximum number of holes between grinds.

* * *

✓ **The complete listing of P&W Reamers is immediately available in all standard sizes from Factory and Branch Office stocks. Special Reamers are engineered to your needs by P&W cutting tool experts.**

You'll find it will pay to head this way for better reamer results. Run comparative tests and note the savings effected.

(A) "Blue Helix" Chucking Reamer — Straight Shank (B) "Blue Helix" Chucking Reamer — Morse Taper Shank (C) Stub Screw Machine Reamers (D) Camlock Adjustable Shell Reamer (E) Taper Shank Jobber's Reamer (F) Hand Reamer (G) Helical Taper Pin Reamer (H) Shell Reamer (I) Precision End Mill Reamer for Jig Borer (J) Camlock Adjustable Chucking Reamer (K) Duplex Spiral Locomotive Taper Reamer.

Pratt & Whitney

Division Niles-Bement-Pond Company

WEST HARTFORD 1, CONNECTICUT

Ask for a copy of the Pratt & Whitney Small Tools Catalog — an indispensable reference not only for finest quality reamers, but for taps, dies, drills, cutters, end mills, counterbores, cut-off tools and thread rolling dies.

REAMERS

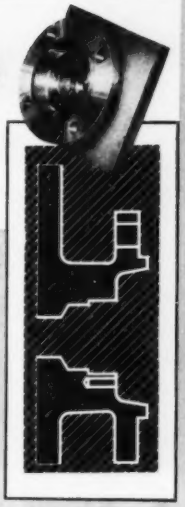
Branch Offices: Birmingham · Boston · Chicago · Cincinnati · Cleveland · Detroit · Los Angeles · New York · Philadelphia · Pittsburgh · Rochester · San Francisco · St. Louis

SOLVE
THE TOUGH ONES
WITH
POWER Flex

HERE'S A GOOD EXAMPLE of what P&J Automatics can do. Take a look at the drawing, and note the amount of stock removed from the blank. That takes power — P&J power.

P&J AUTOMATICS are made for just the kind of machining that calls for tooling the turrets and cross slides up to the hilt, to get the most out of the machine and still consistently produce fine finishes to close tolerances. You just can't duplicate this combination of power, flexibility and tooling — engineered at P&J by top flight tooling specialists whose experience tells them how best to schedule a sequence of operations for the highest possible efficiency and output. It costs you nothing to check your tough problems with P&J engineers . . . just send us your prints for time-study, and the chances are favorable you'll benefit by the recommendations. There's no obligation.

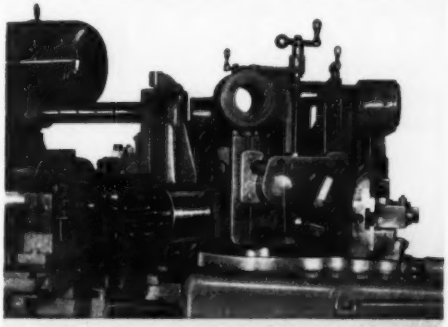
HERE'S THE WORK

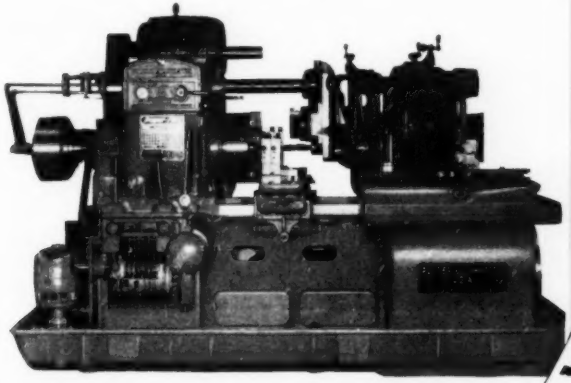


Steel base. Large OD 5.5". Machined from the square billet in the floor-to-floor time of 10.35 minutes.

HERE'S THE TOOLING FOR 27 FULLY AUTOMATIC OPERATIONS

The power of the P&J 5D Power-Flex quickly removes large amounts of stock from the bore; still more from between the flanges. Drill Head simultaneously drills 8 holes.





1st TF — Step drill. Breakdown OD with 3 tools.

2nd TF — Machine 1 dia. C'bore. Face flange and form turn dia. Rough machine groove and form turn dia. Turn small flange.

3rd TF — Finish turn small flange. Chamfer. Finish face flange and finish form turn dia. Finish face large flange.

4th TF — Groove and chamfer C'bore. Chamfer flange and step dia.

5th TF — Size turn OD.

6th TF — Drill 4 holes in body, 4 holes in flange.

Potter & Johnston Company

Pawtucket, R. I.

subsidiary of Pratt & Whitney Division Niles-Bement-Pond Company

P&J

AUTOMATIC CHUCKING AND TURNING MACHINES

GRAY SPACE SAVER DRIVE....

Designed for double housing and open side planers the Gray Space Saver Drive (pat. app. for) gives these extra advantages:

- GRAY "Floating Shaft" eliminates usual flexible coupling with its noise and backlash, as well as wear on bearings caused by motor misalignment.
- Maximum load carrying capacity with enduring smoothness of motion.
- Fewer gears, shafts and bearings needed.
- Protects motor from dust and grit.
- Saves valuable floor space.

The G.A. GRAY Company

CINCINNATI 7, OHIO, U. S. A.

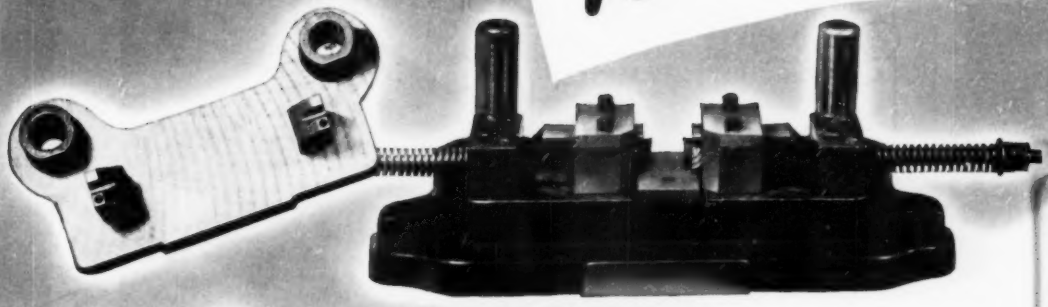
planers • milling planers
planer type milling machines
horizontal boring machines

SOLD IN CANADA BY UPTON, BRADEEN AND JAMES, LTD. • SOLD IN LATIN AMERICA BY MACHINE AFFILIATES

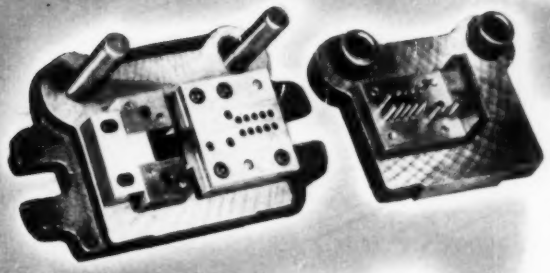
BTR

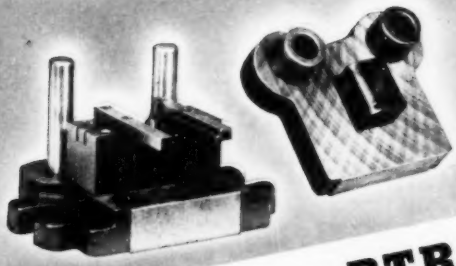
BETHLEHEM TOOL ROOM

The Safe-hardening TOOL STEEL



Squeezing, punching, and forming dies made from BTR. This general-purpose tool steel is a dependable choice for a wide range of tools and dies.





BTR . . . one of our most popular grades . . . is a great deal more than just an "oil-hardening" tool steel. Though often selected primarily for its safe-hardening characteristics, BTR is a favorite with toolmakers because . . .

It is easy to machine and heat-treat
It is high in both wear- and shock-resistance
It has low distortion in heat-treatment

BTR is backed by years of making good in tool and die shops. Toolmakers have confidence in its ability to harden in oil at low quenching temperatures, without fear of cracking hazards. Important, too, is the general utility of BTR. Use it for a wide range of tool and die jobs and you'll probably find, as others have, that it replaces several grades you're now using. BTR is reliable: you can count on it.

Call your nearest Bethlehem Tool Steel distributor or Bethlehem sales office. They'll give you full details and arrange for prompt delivery.

QUICK FACTS ABOUT BTR

	C	Mn	W	Cr	V
Typical Analysis:	0.90	1.20	0.50	0.50	0.20

Annealing: 1450 F, 202 Brinell
Hardening: 1475 F, oil-quench
Tempering: 325 to 400 F, Rockwell C 58 to 62
Toughness and Wear-Resistance: Good
Distortion-Resistance: Good
Resistance to Decarburization: Very Good
Machinability: Very Good
Application: For all general-purpose tools and dies which require a safer-hardening grade than carbon tool steel.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by
Bethlehem Pacific Coast Steel Corporation

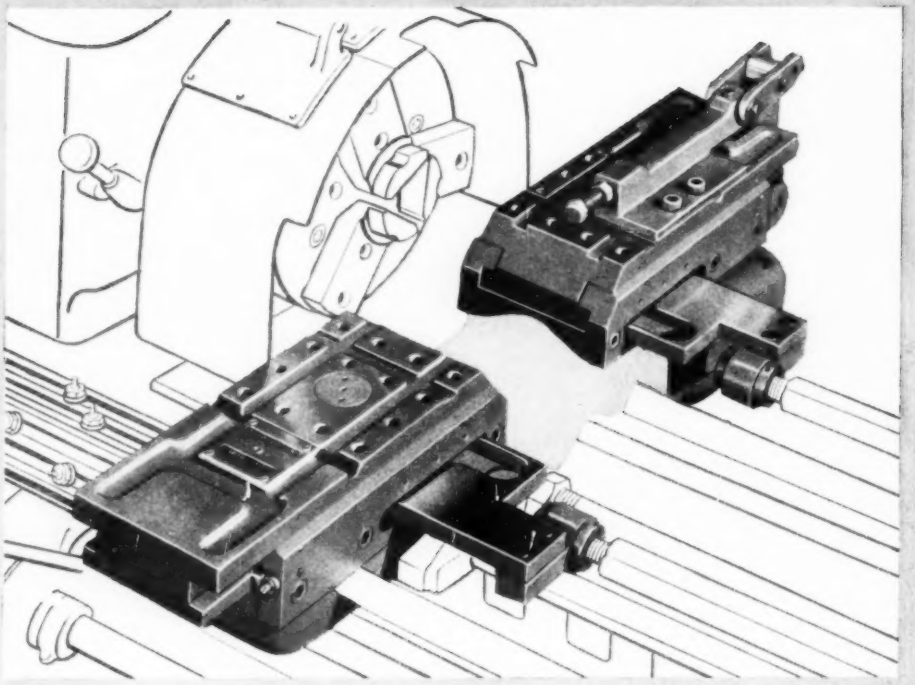
Export Distributor:
Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BTR . . . one of Bethlehem's fine tool steels

GISHOLT FASTERMATICS

(Automatic Turret Lathes)



Separate front and rear cross-slides permit independent or simultaneous operation . . . providing utmost flexibility in tooling setups

. . . GREATER PRODUCTION*

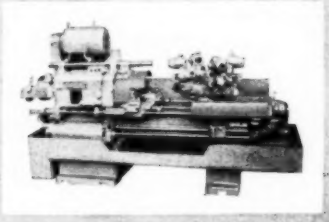
GISHOLT MACHINE COMPANY

Madison 3, Wis.

THE GISHOLT ROUND TABLE represents the collective experience of specialists in machining, surface-finishing and balancing of round or partly round parts. Your problems are welcomed here.

TURRET LATHES • AUTOMATIC LATHES

SUPERFINISHERS • BALANCERS • SPECIAL MACHINES



*** Each of the Fastermatic's independent cross-slides can be used as many times as necessary within the turret cycle. Thus, you can do more different jobs.**

What's in
VERMONT
this month?

THREE POINTS FOR ACCURACY

THE value of a machine tool lies not only in the fact that it will produce a given job to specified tolerance, but, more important, is the fact that it will produce those parts day in and day out for the life of the machine. A machine can be designed and constructed in such a way that it will hold its original built-in accuracy. A surface plate, for instance, is ribbed and cast with uniform thickness to avoid distortion in fabrication and in use. And, like the old milking stool, it stands on three points so that it will be firm and free from distortion wherever it is used.

The Bryant No. 216 Automatic Grinder is designed and built on the same principle as a surface plate. The main castings are ribbed, and stand on three points to avoid outside distortion. The Bryant Precision slide, which carries the wheelhead, is supported at three points.

Throughout the machine, careful consideration is given to simple fundamentals of design to assure a long life of accurate production. This is an illustration of the importance of unseen features built into the products of the progressive machine tool manufacturer.

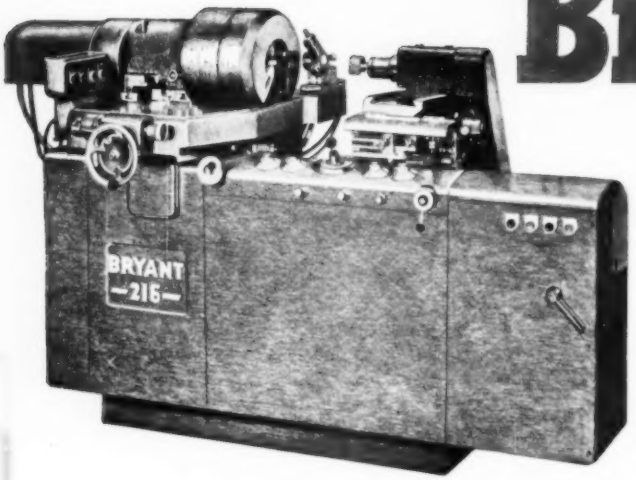
It won't cost to inquire.

Bryant Chucking Grinder Co. • Springfield, Vermont, U.S.A.

BRYANT

Number 216

HYDRAULIC INTERNAL GRINDER



The No. 216 is a precision, high-production, automatic internal grinder for grinding bores up to 8 inches in diameter, up to 6 inches long. Other Bryant equipment will grind work through the complete range up to 60-inch diameter swing. Write to the factory for full information.

SPECIFICATIONS

Total swing	16 inches
Maximum traverse	15 inches
Maximum hole depth	6 inches
Will grind included angle	60°
R.P.M. of work spindle	140 — 200 — 280 — 400
Net weight	6,500 lbs.
Floor space — 90 inches x 70 inches (with coolant tank)	

SLIDES
Wheelhead on Bryant cylindrical slide; workhead (for cross feed) on anti-friction bearings.

WORKHEAD
Precision ball bearing spindle. Standard spindle nose.

WHEELHEAD
Interchangeable belt driven, or Hi-Frequency anti-friction bearings.

TRAVERSE
Hydraulic, infinitely variable.

CROSS FEED
Variable speed automatic feed. Hydraulic, infinitely variable, automatic sizing.

You can *"See the Difference"* with a BRYANT GAGE

BRYANT ADJUSTABLE THREAD GAGES

The Bryant Adjustable External Thread Gage provides speedy, highly accurate inspection of different sized parts having the same pitch and thread form. The segments are designed to maintain 90° contact with the work regardless of diameter within a range of 1 to 2½ inches. Accommodation of various pitches and thread forms is accomplished with easily changed thread segments. To compensate for wear on the segments, the side face can be surface ground to present an entirely new thread profile. The segments are easily replaced against the locating faces.

It is no longer necessary to "feel for fit" with plug and ring gages when inspecting threads. The Bryant Thread Gage shows, on a dial indicator, whether a thread will assemble properly with its component.

At a glance, anyone can compare threaded parts with a master and tell the whole story immediately — size, presence of burrs, out-of-roundness, accumulated inaccuracies of pitch, lead, diameter and thread form.

It's fast too. The design incorporates three thread segments, two stationary and one movable. The segments are operated by a thumb lever — the part is dropped between the segments — the lever is released, causing immediate contact of segments to threads — a one third turn of the part inspects it all over.

Send samples or drawings for a complete story on how Bryant can save inspection money for you.

Bryant Chucking Grinder Co. • Springfield, Vermont, U.S.A.

THE BULLARD COMPANY

BRIDGEPORT, CONNECTICUT

Adding to its line . .

The Products formerly manufactured by

UNIVERSAL BORING MACHINE COMPANY

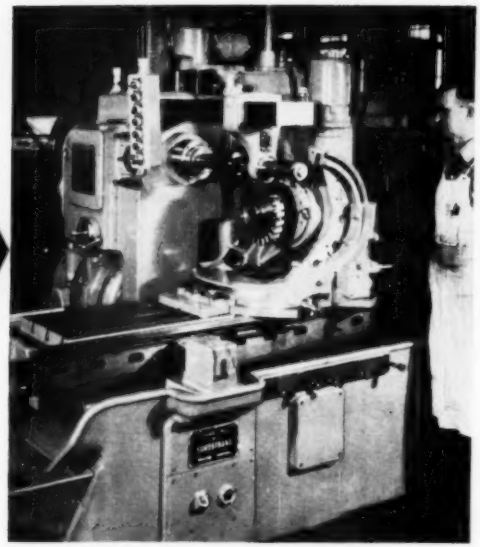
HUDSON, MASSACHUSETTS

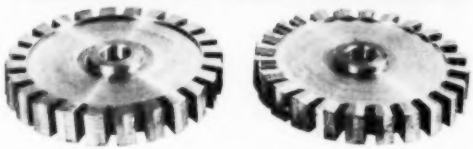
We take pleasure in offering to you our complete line of Bullard built machines consisting of . . . Cut Master & Man-Au-Trol Vertical Turret Lathes — Mult-Au-Matic Vertical Chucking Machines — Contin-U-Matic Rotary Type Vertical Chucking Machines — Man-Au-Trol Horizontal Lathes — Bullard Spacers.

AND NOW

Bullard Universal Boring, Milling & Drilling Machines . . . We take this opportunity to assure you of our continued cooperation in solving your machining problems backed by our seventy years of service to the metal working trades.

YOU'LL GET PRACTICAL MILLING METHODS LIKE THESE WITH SUNDSTRAND "ENGINEERED PRODUCTION"





Basically, there are two approaches to solving milling production problems, (1) obtaining standard machines, then trying to process parts over these machines as economically as possible, (2) designing the most profitable processing method, then obtaining machines to suit this method — standard or semi-standard machines, if possible, or entirely special machinery, if necessary.

The latter method is Sundstrand "Engineered Production" . . . the most practical approach to economical milling. The following is a brief resume of the complete engineering and manufacturing service available from Sundstrand to meet any of your production milling requirements.

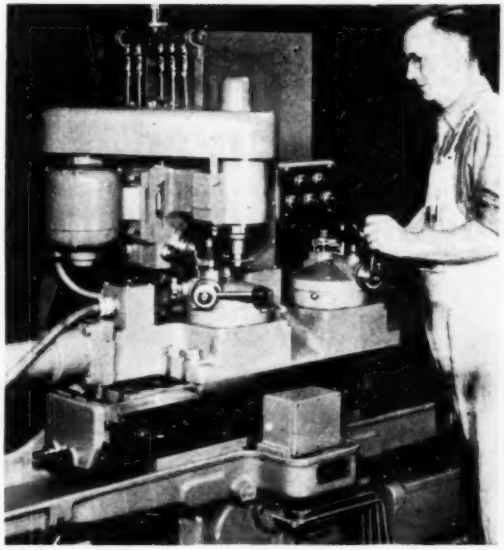
These actual examples are presented to reveal one of each of the methods used in solving milling production problems. One of these methods may be the solution to your present problem.

1 *Milling Blade Slots and Chip Clearance in Cutter Bodies with a Standard Rigidmil*

Here's a practical solution to milling a large number of different size parts requiring similar operations. These milling cutter bodies come in small lot sizes from one to eight. They require milling cuts on both the face and O.D. The machine used is a standard Sundstrand Model 33 Rigidmil with a power operated elevating attachment for positioning the head. A universal automatic index fixture was provided in order to handle the wide range of cutter body sizes. This index unit handles automatic spacing from 2 to 40 spaces . . . can be adjusted vertically thru 110° (from 10° below horizontal to 10° past vertical) and thru 90° horizontally (45° each side of the centerline of the table). Compared to the former method, this Sundstrand equipment reduced the machining and set-up time for these operations from 19.2 to 10.4 hours on a total of 30 parts of 8 different sizes.

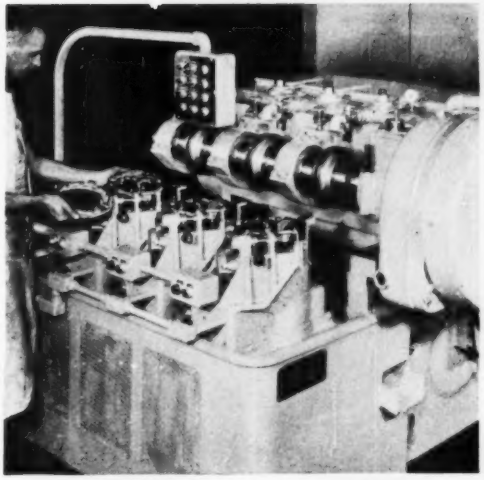
SUNDSTRAND MACHINE TOOL CO. ROCKFORD, ILLINOIS, U.S.A.

RIGIDMILS • FLUID-SCREW RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT



2 Standard Rigidmil with Special Head Mills 145 Brake Shoes Per Hour

This Sundstrand Rigidmil is provided with a special high speed head equipped with one vertical and one horizontal spindle. Each spindle has endwise adjustment, and the horizontal spindle is provided with automatic retraction. Two power operated rotary tables are timed and interlocked with the automatic table cycle for rotary milling of the face and slot in washing machine brake shoes. Manually clamped fixtures hold the part for a cycle of load and unload at one end while milling at opposite end. Production is approximately 145 per hour.

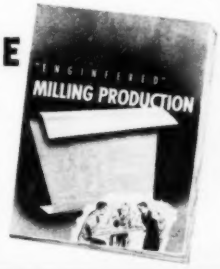


3 Special Rigidmil Mills Over 250 Clutch Plates Per Hour

This special traveling head Sundstrand Rigidmil mills the top and both sides of three lugs on various sizes of clutch plates at a rate of one completed part per machine cycle. The machine operates in an automatic cycle started by push button. It has three work-holding stations each with a three position automatic index fixture. At the end of each cycle of the head, the work part at one station is automatically unclamped, manually unloaded and loaded, and automatically clamped. One part is completed with each cycle, and production obtained is approximately 250 pieces per hour.

More Proof...FREE

Write for more proof of the successful application of Sundstrand "Engineered" milling production. This 40 page book contains over 35 actual problem solutions together with interesting tooling diagrams. Write for your copy today. Ask for Bulletin No. 182.



SUNDSTRAND
MACHINE TOOL COMPANY
2533 Eleventh St. • Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES

Get the cost saving advantages of advanced engineering design

FEATURING

THE EXTENDED SPINDLE FACE

This exclusive feature offers 8 advantages:

Greater rigidity of cutter support. Front spindle bearing is nearer center of table. Overarm and arbor lengths between supports are reduced . . . minimizing arbor springing.

Reduced cutter and arbor vibration and cutter wear because cutters are mounted closer to spindle nose.

Reduced cutter costs, both initial and operating. Extra sturdy arbor support permits use of smaller arbors, using smaller diameter (less expensive) cutters.

Greater production because smaller cutters feed faster at same surface finish.

Shorter run-in required by smaller diameter cutters reduces the length of feed and minimizes non-cutting time.

Convenient location of table . . . work always near operator—less reach.

Added clearance for work and fixtures. Spindle nose extends forward approximately 3" from conventional position.

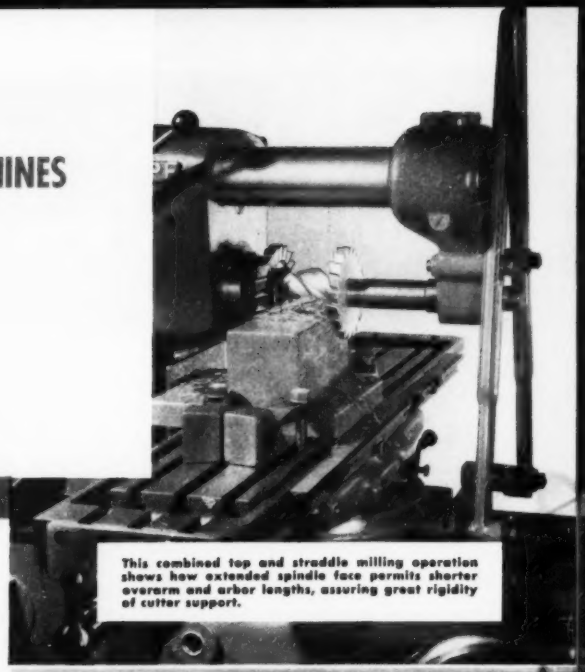
Greater rigidity of attachments without loss of throat distance.

BROWN &

. . . in

No. 2 UNIVERSAL AND No. 2 PLAIN MILLING MACHINES

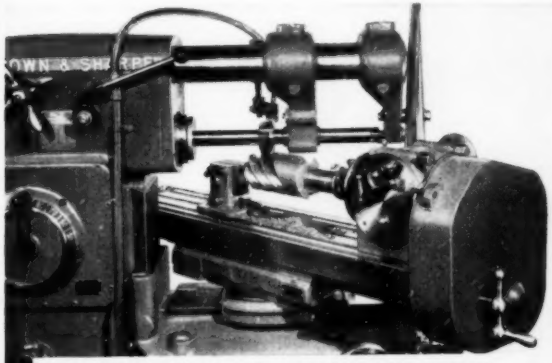
5 HORSEPOWER SPINDLE DRIVE



This combined top and straddle milling operation shows how extended spindle face permits shorter overarm and arbor lengths, assuring great rigidity of cutter support.

These New Machines embody the same advanced operating features that have proved so efficient and so profitable in the Brown & Sharpe No. 2 Light Type Machines. In addition, they have ample power to take heavier cuts; an increased vertical capacity; a No. 50 milling machine standard taper hole in spindle; suitable speeds for larger cutters; larger overarms and extra rigidity for using greater power. Their advantageously-placed driving motors avoid power loss in the machine.

Investigate the cost-cutting, time-saving features of these new 5 Horsepower Machines for long and short runs. Write Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.



This milling operation shows how extended spindle face permits cutting closer to spindle nose with considerable swing of table. Also shows universal spiral index centers with heavy trunnion-type headstock for rigidly supporting work on heavy cuts.

ENGINEERING FEATURES

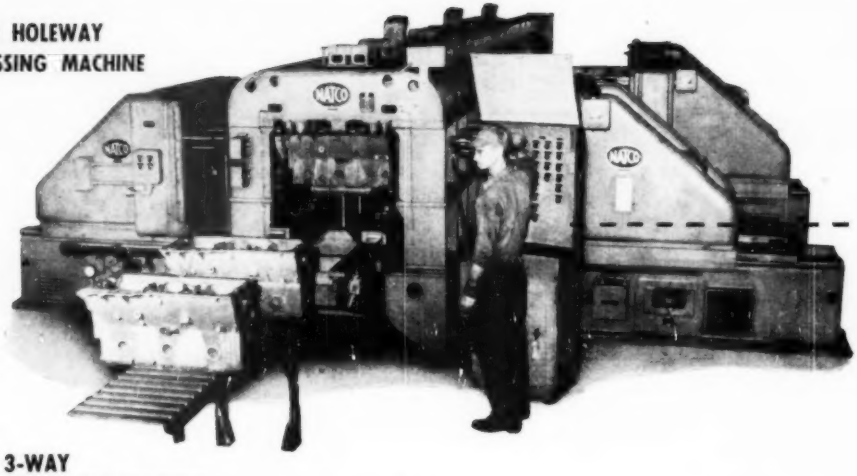
- Full 5 horsepower drive to cutters—all gear drive, eliminating clutch, belts, chains and sprockets.
- Independent all gear drive to cutting feed and fast travel movements. Driven by ¾ H.P. motor synchronized with spindle motor. Fast travel available with spindle rotating or stopped.
- 18 changes of spindle speeds, 30 to 1200 R.P.M. Power imparted to spindle at all speeds directly back of front bearing mounting.
- 18 changes of cutting speeds in useful range of ½" to 20¼" per minute, uniform in all directions.
- Fast travel, 75" per minute in *all* directions.
- Coolant system operated by ¼ H.P. motor-driven Centrifugal Pump—automatically stops when spindle stops. Disconnected by switch when not required.
- Full automatic lubrication—column, knee, table, saddle and slides.
- Electrical controls conform to MTE standards.
- CAPACITY: Longitudinal feed 28"; transverse feed 10"; vertical feed, 16½".

SHARPE

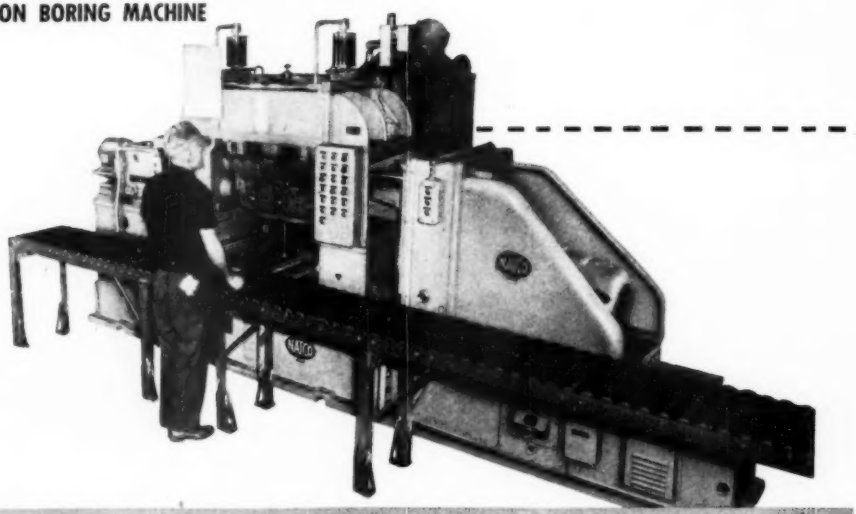
B·S

How NATCO Machines Speed Automatic Production.....

NATCO HOLEWAY
PROCESSING MACHINE



NATCO 3-WAY
PRECISION BORING MACHINE



NATIONAL AUTOMATIC TOOL COMPANY, Inc.
RICHMOND, INDIANA, U. S. A.

Branch Offices:
1809 Engineering Bldg., Chicago
409 New Center Bldg., Detroit
1807 Elmwood Ave., Buffalo
2902 Commerce Bldg., New York City

...from rough to precision finishing cam and crank holes

FOR A PROMINENT MOTOR CAR COMPANY

PART—Cylinder block.
PRODUCTION—66 parts per hour.
OPERATIONS—Core drill four crank bearings from rough to 2.6306. Core drill four cam bearing from rough to 2.4375—2.0625—2.0312—1.5625. Counterbore outer wall of cam bearing 1.8125 x .2344. Chamfer front side of four cam bearings 1/16" x 45°. Chamfer both sides of rear center crank bearings 3/32" x 45°. Comb. rough bore four crank bearings to 2.6718. Comb. rough bore four cam bearings to 2.4848—2.1098—2.0778—1.6078. Comb. semi-finish bore four cam bearings to 2.6875. Comb. semi-finish bore four cam bearings to 2.5047—2.1297—2.0977—1.6277.
MACHINE—NATCO HOLEWAY Processing Machine completes all the above operations at one time, clamping, locating and processing from one operation to another automatically.

PART—Cylinder block.
PRODUCTION—45 parts per hour.
OPERATIONS—Precision finish bore four crank bearings to 2.691. Precision finish bore four cam bearings (in babbit) to 2.3751—1.9971—1.9651—1.4971. Finish counterbore two holes to .6202. Precision finish bore oil pump and distributor shaft holes to 1.0634" and 1.7499".
MACHINE—NATCO 3-Way Machine for the final precision operations on cam, crank oil passage and distributor holes.

★ **IMPORTANT READING**—NATCO invites you to read a new series of case histories. By taking you behind the scenes and getting down to hard facts, NATCO Field Engineers show you step by step how they make vital production savings possible through the application of small light sensitive NATCO Machines as well as NATCO Automatic Processing Machines.

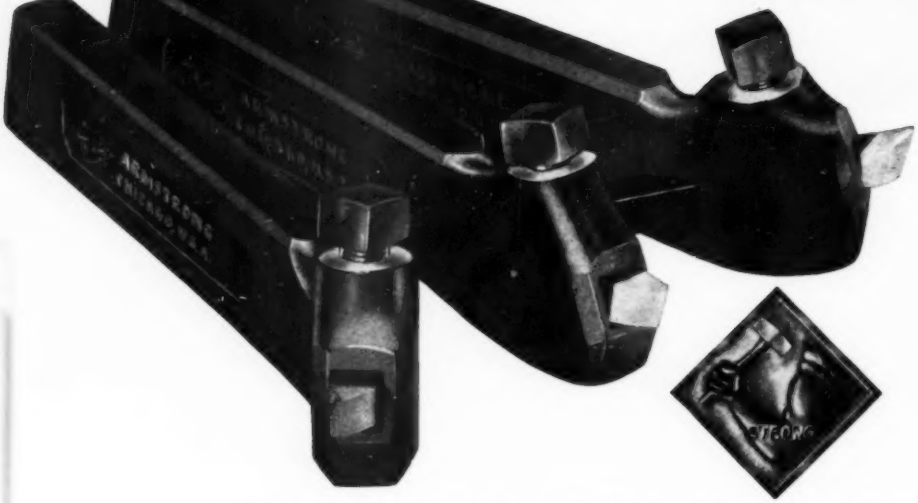
Whether or not you are now receiving NATCO mailings regularly, be sure to send in your request for "Success Stories from the Brief Case of NATCO Field Engineers." Write today . . . request: Success Stories, Department AM, NATCO, Richmond, Indiana.

NATCO

Call a Natco Field Engineer

NATCO DRILLING, BORING TAPPING and FACING MACHINES

ARMSTRONG



ARMSTRONG TOOL HOLDERS

are more efficient

It takes years of development, improvement and practical experience to create and perfect a line of tools. This has been the specialized work of ARMSTRONG, a contribution to machining efficiency which they have carried on continuously for 59 years.

Starting with the Armstrong Principle of inserted cutters in permanent tool shanks that "Saves: all Forging, 70% Grinding and 90% High Speed Steel," they created this unique method of tooling which has changed shop practice in over 96% of the machine shops and tool rooms. And, today, in a specially built plant, equipped with every modern facility and staffed with experts in each phase of tool making, this work goes on.

To you, as a tool user, here is always one safe principle—specify ARMSTRONG TOOL HOLDERS for every operation on lathes, planers, slotters and shapers, for turret lathes and screw machines. They are cataloged and stocked by all leading supply houses.

Write for the New S-48 Catalog just released

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

5215 W. ARMSTRONG AVE. CHICAGO 30, U.S.A.

Eastern Whse. & Sales Office 199 Lafayette St., New York 12, N. Y.
Pacific Coast Whse. & Sales Office 1275 Mission St., San Francisco 3, California

CLEEREMAN DRILLING MACHINES

secure REPEAT ORDERS on the basis of PERFORMANCE

Cleereman Drilling Machines have introduced a new conception of drilling machine performance.

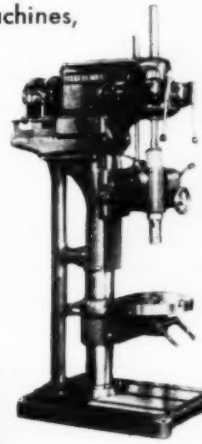
That is why present users send repeat orders . . . they know from their own experience exactly what Cleereman Drilling Machines will do. Prospective users want Cleereman after they have checked performance and maintenance records.

If you do not now use Cleereman Drilling Machines, let us refer you to an installation for your personal inspection.

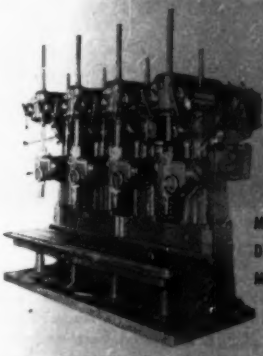
Write for Catalogs.

#325 SINGLE UNIT SLIDING HEAD DRILLING MACHINE

BOX COLUMN SLIDING HEAD DRILLING MACHINE



ROUND COLUMN SLIDING HEAD DRILLING MACHINE



MULTIPLE DRILLING MACHINE

BRYANT Machinery & Engineering Company
General Office
400 West Madison Street, Chicago 6
Representatives in Principal Cities

Affiliated with—

CLEEREMAN MACHINE TOOL CO. Green Bay, Wis.

BUILDERS OF PRECISION JIG BORERS AND DRILLING MACHINES

TIMKEN® bearings eliminate "spindle quiver" in new Hill surface grinder

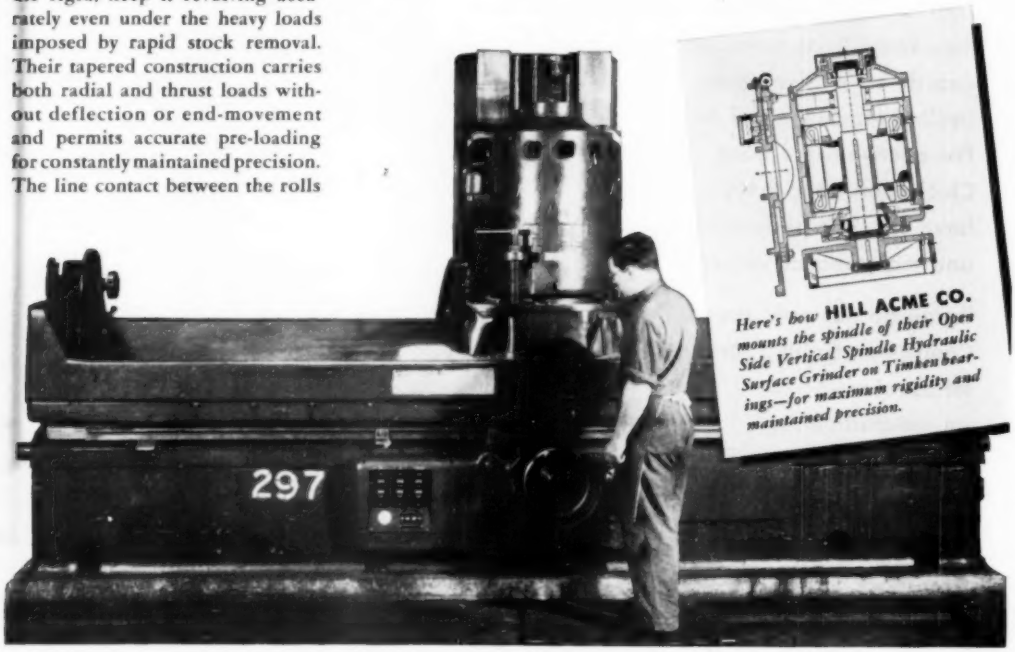
THE 26" segmental grinding wheel used in this "Hill" Open Side Vertical Spindle Hydraulic Surface Grinder puts a heavy responsibility on the spindle. The slightest sign of spindle eccentricity or quiver would show up in the finished work. That's why The Hill Acme Co. mounts the spindle on Timken® tapered roller bearings.

Timken bearings hold the spindle rigid, keep it revolving accurately even under the heavy loads imposed by rapid stock removal. Their tapered construction carries both radial and thrust loads without deflection or end-movement and permits accurate pre-loading for constantly maintained precision. The line contact between the rolls and races gives the spindle maximum support and provides tremendous load-carrying capacity.

The rolls and races of Timken bearings are made of Timken fine alloy steel for toughness, then case-hardened for extra resistance to wear. Finishing to almost incredible smoothness practically eliminates friction. Normally, Timken bearings last the life of the machine.

Timken bearings in precision machine tools like this are a valuable sales feature that every buyer recognizes. Be sure you have them in all the machine tools you buy or build. Look for the trade-mark "Timken" on the bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



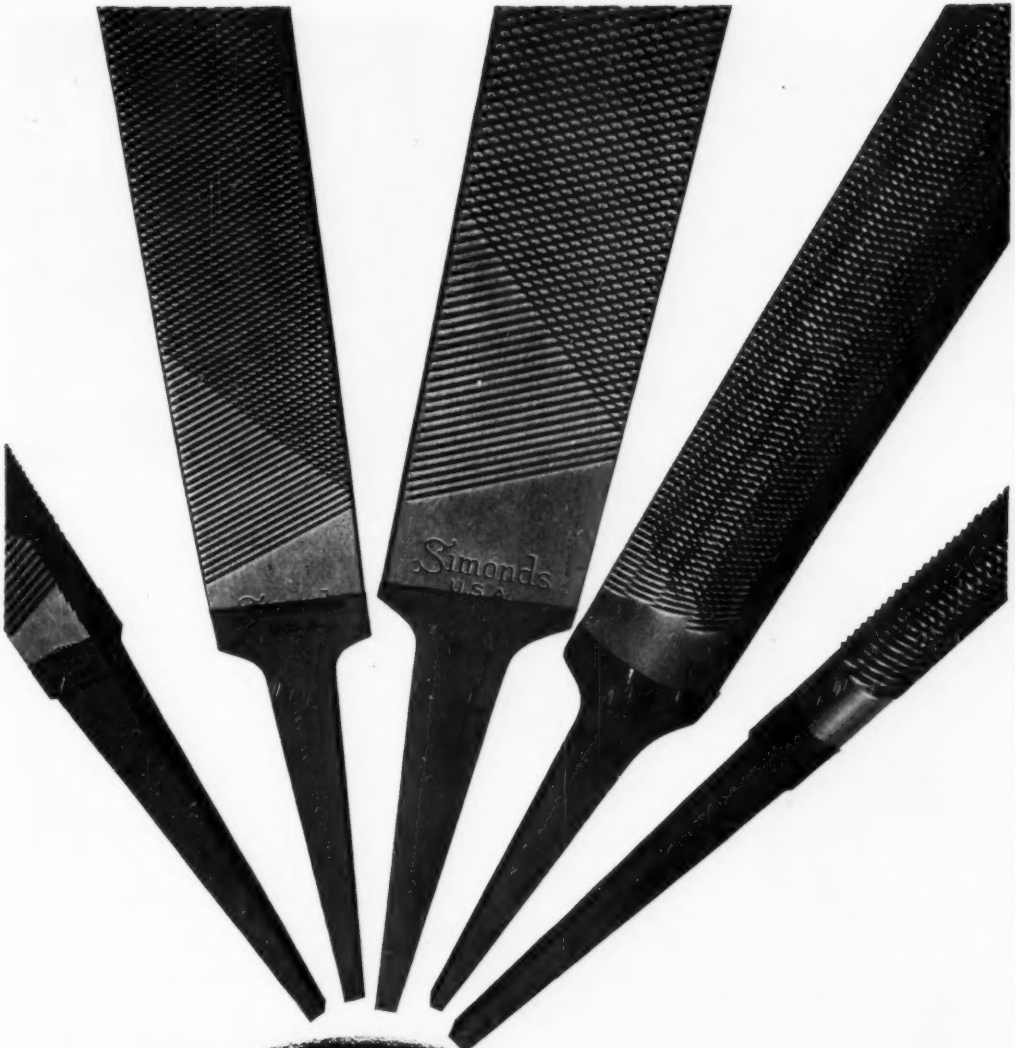
Here's how **HILL ACME CO.** *mounts the spindle of their Open Side Vertical Spindle Hydraulic Surface Grinder on Timken bearings—for maximum rigidity and maintained precision.*

GENERATED UNIT ASSEMBLY

An extra step in the manufacture of Timken bearings—after assembly—results in a natural and true geometric contact being generated between all rotating parts. This perfect mating of the component parts—cone, rolls and cup—assures positive roll alignment, long lasting precision, permanent adjustment and smooth operation.

TIMKEN
TAPERED
ROLLER BEARINGS

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ◫ AND THRUST ⊣◫⊢ LOADS OR ANY COMBINATION ✳



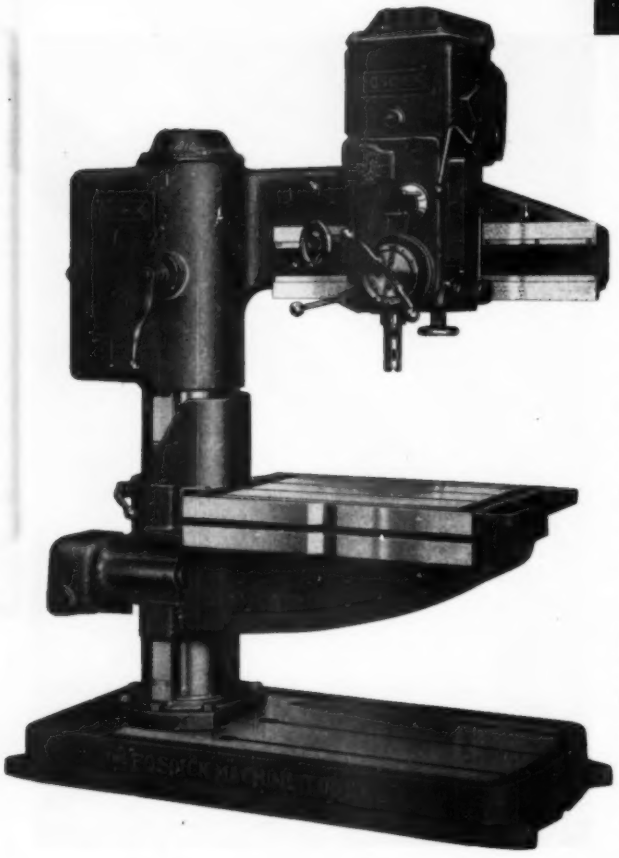
These RED TANGS Mean More File-Mileage

There's no other file like a "Red Tang" File, because: 1—It's the only file made to Simonds' single standard of quality. 2—It's the only file made with teeth designed like Simonds Metal-Cutting Saw teeth . . . teeth that *cut* instead of scrape. 3—Every "Red Tang" File is *individually* hardened, brine-quenched, and straightened. 4—Salt bath brings blade out cleaner, with sharper teeth. Prove Simonds Consistent Cut-Ability for yourself. See your Industrial Supply Distributor . . . or call the nearest Simonds office . . . and get *more file-miles per dollar.*

SIMONDS
SAW AND STEEL CO.
FITCHBURG, MASS.
Other Divisions of SIMONDS SAW AND STEEL CO. making Quality Products for Industry
SIMONDS — Special Electric Furnace Steels
SIMONDS — Grinding Wheels and Grains
SIMONDS — Simonds Products for Canada

BRANCH OFFICES: 1350 Columbia Road, Boston 27, Mass.; 127 S. Green St., Chicago 7, Ill.; 416 W. Eighth St., Los Angeles 14, Calif.; 228 First St., San Francisco 5, Calif.; 311 S. W. First Ave., Portland 4, Ore.; 31 W. Trent Ave., Spokane 8, Washington. *Canadian Factory:* 595 St. Remi St., Montreal 30, Que.

Something New— has been added to the FOSDICK *Sensitive* RADIAL



● The Fosdick Sensitive Radial now comes completely equipped with a tool pan at the right end of the table and a new column and rack guard.

The tool pan is a convenient place to carry drills, taps, reamers and other tools also may be used for wrenches when required.

The guard protects both the column and table elevating rack from chips and dirt.

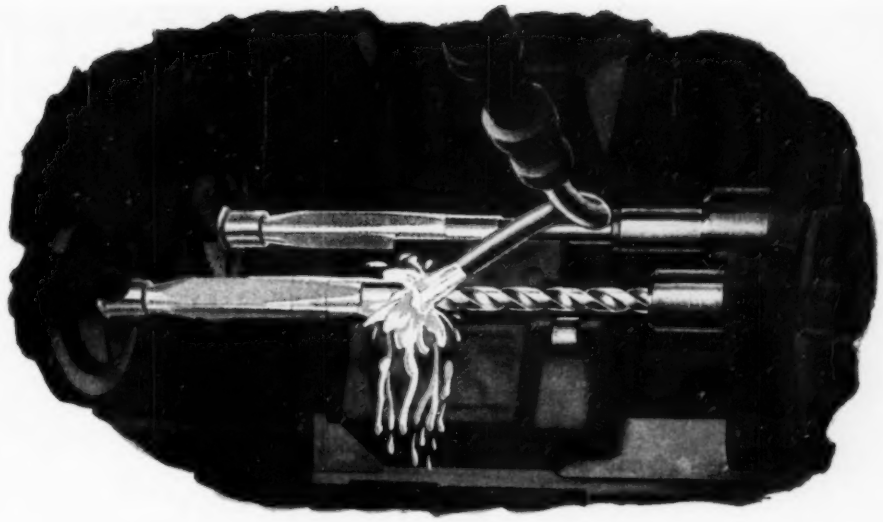
These refinements add even greater utility to this versatile machine tool. Built along the general design of a Radial it has, in addition to the standard base, an adjustable table which enables operator to place table in correct position for the job at hand. The arm is located at a fixed height and both it and the table swing in an arc of 360°.

The Fosdick Sensitive Radial, the original machine of its type, was first presented a little over a year ago and today this machine is operating in shops in the important industrial areas from coast to coast.

This machine has all the versatility of a Radial plus its application to sensitive drilling work.

Write for full details contained in the new Fosdick Sensitive Radial Bulletin S.R.A.

FOSDICK MACHINE TOOL *Company*
CINCINNATI 23, OHIO



DEEP-HOLE DRILLING IN ALCOA ALUMINUM

You'll scrap fewer parts and save machine time when you use good, deep-hole drilling procedure.

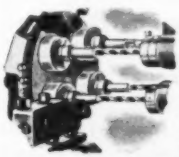
Deep-hole drilling can be done in any of the Alcoa Screw Machine Alloys. However, if drilling is the primary consideration, choose 17S-T4. It's best for the job.

Use a straight flute drill, for average deep-hole drilling. In 24S-T4 and 61S-T6 alloys, use either a high or slow spiral drill. All three have wide flutes that readily pass up the chips. For very deep holes, use half round drills. Use a standard drill for the first entry to about three drill diameters, then follow with the half round drill. This procedure insures good support for the half round drill.

An entire chapter of the free booklet, "Alcoa Aluminum in Automatic Screw Machines" is devoted to drilling. Ask for your copy at your nearby Alcoa sales office. And remember to draw on Alcoa's 60 years of aluminum experience. ALUMINUM COMPANY OF AMERICA, 1709 Gulf Building, Pittsburgh 19, Pennsylvania.

MARGIN THINNING AND WEB THINNING—You'll increase drill life and reduce heat by thinning the margins along the edges of the drill flutes. As the drill is ground back, the web must be thinned at the point.

DRILL ANGLES—In deep-hole drilling with a single drill, the included angle should be larger than the standard 118° to produce a narrower chip that readily passes up the flutes. When several drills are used, each succeeding drill should have a larger included angle. The new drill then centers on the periphery.



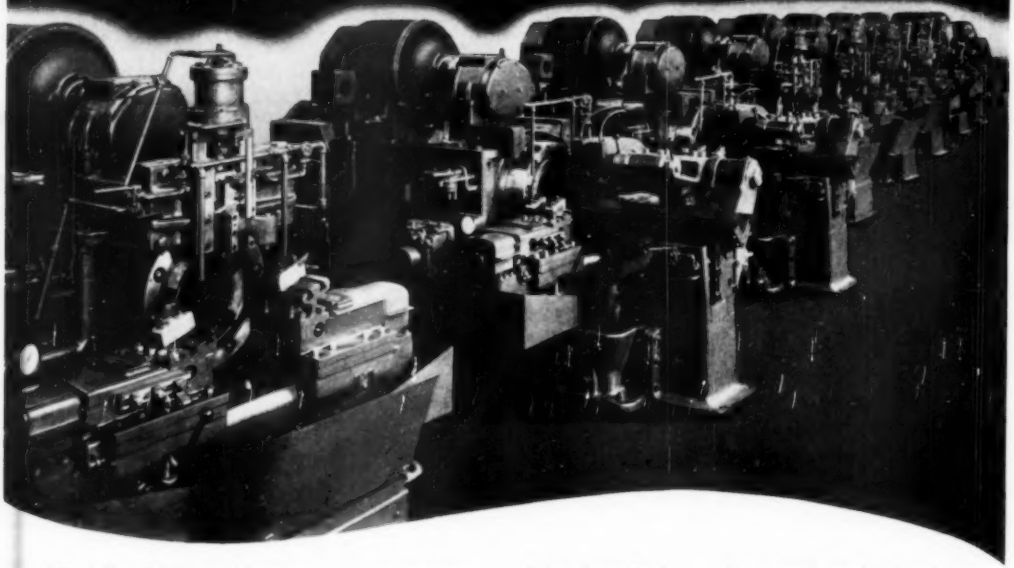
BACK OUTS AND MULTIPLE DRILLS—Prevent chips from jamming in the flutes by drilling to the recommended depth on each pass and then backing out the drill completely, or indexing to the next drill.

GOOD MACHINING PRACTICES SAVE METAL

ALCOA FIRST IN ALUMINUM

ALCOA ALUMINUM

BARDONS & OLIVER 14½" HEAVY DUTY HYDRAULIC CUT-OFF MACHINE *Can Be Depended On* to keep up the flow of Pipe and Tubing at the mill!



All of the above machines went to one customer.

These Cut-Off Machines are preferred for fast production because they are designed right and built right.

The ends of tubing and pipe are cropped and chamfered outside and inside. For couplings and other similar work, the machine can be equipped with chamfering attachment, stock stop and roller feed.

The two hydraulically operated tool slides are synchronized to divide the cut and thus reduce the time. The feed can be quickly and easily adjusted for maximum thickness of chip. The powerful collet chuck and the roller feed are air operated.

For ease and convenience of control, the machine is outstanding. A single lever starts the tool slides through the semi-automatic cycle. Another conveniently located lever opens and closes the collet chuck and controls the feeding and stopping of the tubing.

The 25 horse-power motor delivers power in excess of requirements of heavy cuts in tough steel. A wide range of spindle speeds, with a maximum of 96 r.p.m. obtained through a multi-speed motor and pick-off gears, makes it easy to obtain the most efficient cutting speeds.

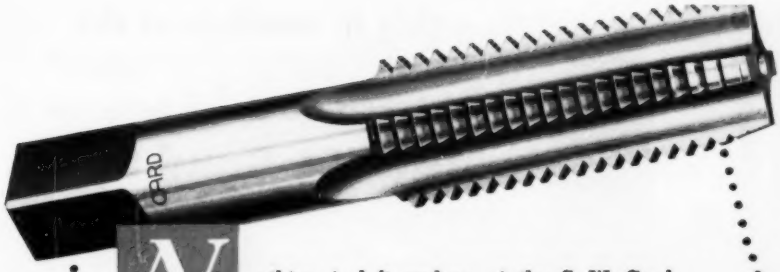
The extremely rigid construction, in combination with heat treated alloy steel drive gears, hardened alloy steel wear plates on slides and saddles, automatic lubrication to gears and bearings gives the machine a long, useful life, with a low maintenance cost.

Write for further information.

We build a complete line of Cut-Off Machines, and also a comprehensive line of ram and saddle type Turret Lathes

BARDONS & OLIVER, INC.

1133 WEST 9TH STREET • CLEVELAND 13, OHIO



Nothing is left undone at the S. W. Card Manufacturing Company's factory at Mansfield, Massachusetts, to insure that every tap reaching your hands is 100% perfect . . . ready to give you top performance over a long service life.

But to make *doubly sure* of your continuing satisfaction we have retained the outstanding PITTSBURGH TESTING LABORATORY to buy Card Taps periodically on the open market *anywhere in the United States* . . . and subject them to rigorous tests to make *certain* that Card Taps reaching the market are right up to standard!

No wonder increasing numbers of metal-working plants whose production schedules *demand* accurate, dependable cutting tools are turning to Card.

And for fast, dependable service that saves you time and money, contact your nearby Card Distributor.

CHECKED HERE BY CARD

DOUBLE CHECKED HERE BY PITTSBURGH TESTING LABORATORY — ANALYSIS · INSPECTION · TESTING · RESEARCH — ENGINEERS AND CHEMISTS

S. W. CARD

MANUFACTURING COMPANY
Mansfield, Massachusetts
DIVISION OF UNION TWIST DRILL CO.

The CARD Quality

TAPS

The Certified Cutting Tools*

*by the Pittsburgh Testing Laboratory

Also makers of DIES · SCREW PLATES
DIE STOCKS · TAP WRENCHES

This is another of the "HUNDREDS OF JOBS" which can be done only on a MARVEL Band Saw!

MARVEL BAND SAW saved these two 4400 lb. castings

Two sand cores washed out when these giant 4400 pound steel connecting rods were cast, resulting in solid eye ends without gaps. Then came the $64 question—how to machine out the 1½" slots in the longitudinal center of the eyes which were 22" high and had a wall thickness of 6½".

The Ernest J. Nelson Iron Works of San Francisco, did this "impossible" job easily, quickly and economically, without special tooling, on a standard Model ⇵8M/2 MARVEL Band Saw. Two cuts were made in each rod in two hours per cut with tool cost of $3.06 per rod. The tool was a MARVEL B9-10 Band Saw Blade.

Every tool room, machine shop and maintenance department needs a MARVEL Series 8 Universal Band Saw—not only for innumerable everyday jobs but for the occasional "trick" operations, where its utmost versatility will save many headaches and dollars.

WRITE FOR CATALOG.

These exclusive MARVEL Features made this job easy.

1. **Large, T-slotted work table.**
2. **Blade feeds into work vertically; work always stationary.**
3. **Power-pressure feed.**
4. **Automatic Blade tension.**
5. **Built-in coolant system.**
6. **Large capacity.**

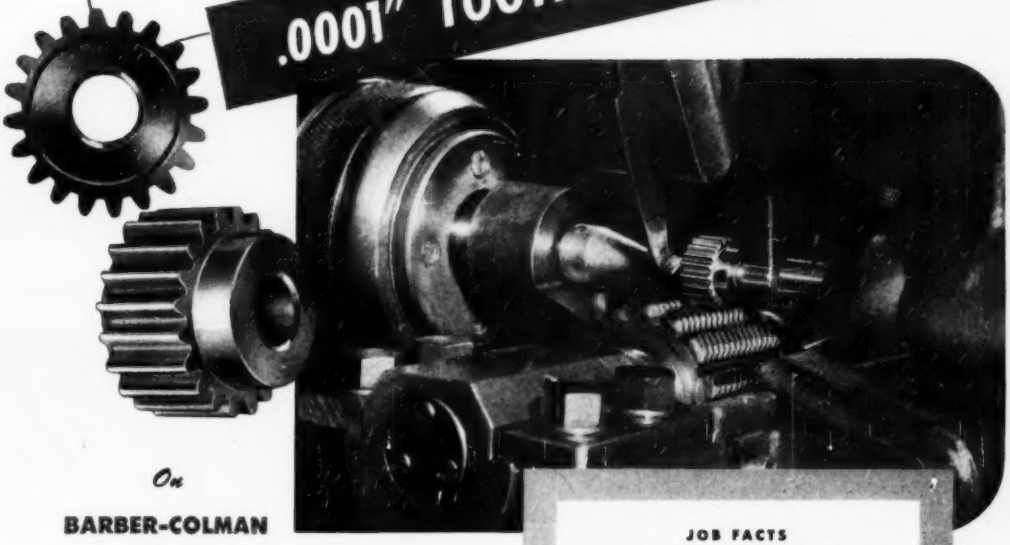
MARVEL *Metal Cutting* SAWS
Better Machines—Better Blades

ARMSTRONG-BLUM MFG. CO.

5700 BLOOMINGDALE AVENUE **CHICAGO 39, ILLINOIS**

SEE OUR CATALOG in SWEET'S FILE

PINIONS HELD TO .0001" TOOTH SPACING!



On

BARBER-COLMAN
No. 6-10
PRECISION
HOBBING MACHINE

JOB FACTS

Operation — Finish Hob Pinion 28 pitch, 20 teeth, .7143" P.D.
Material — Tough Bronze
Hobs — B-C Class A Precision 2⅛" x 1⅜" x taper bore
Fl-to-Fl — 5.35 minutes
Feed — .012" per rev.
Speed — 309 RPM
Tool Life — 180 Pieces per Hob Sharpening

This scale manufacturer reports about his Barber-Colman No. 6-10 Precision Hobbing Machine: "... we have searched the latest methods of producing precise and accurate pinions, and find regardless of cost limitations within reason, the method now in use is equal to any available or used to our knowledge elsewhere."

Precision cut gear teeth are of major importance in scale manufacture because any error in tooth form or spacing is reflected in the indicator on the scale. In this operation, conditions are ideal for accuracy, and pinions are hobbed to total indicator readings as follows: eccentricity, .0003"; individual tooth spacing error, .0001"; error from true involute form, .0001".

For maximum economy and accuracy in gear production, Standard and Precision No. 6-10 Hobbing Machines are now available for improved delivery. Write our engineering Department for additional information.

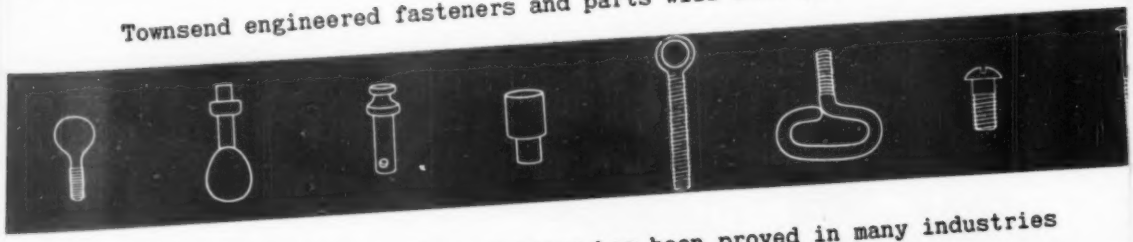
Barber-Colman Company

GENERAL OFFICES AND PLANT, 1115 LOOMIS ST., ROCKFORD, ILLINOIS, U. S. A.

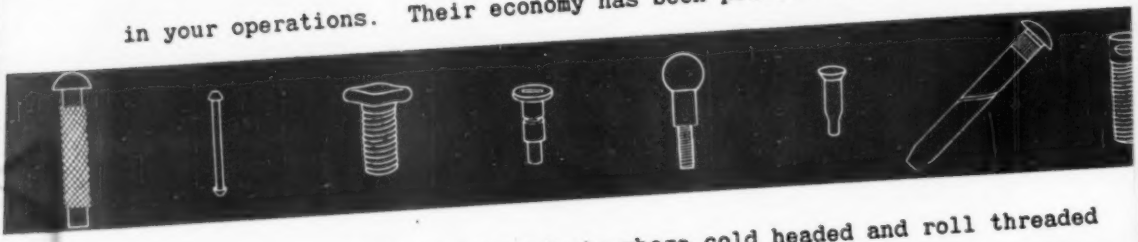
For details on the No. 6-10 Hobbing Machine, write for this free Bulletin No. 1115.

BARBER COLMAN

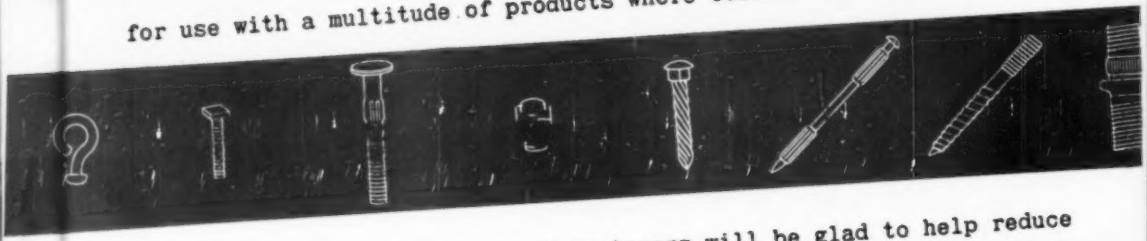
Townsend engineered fasteners and parts will save you time and money



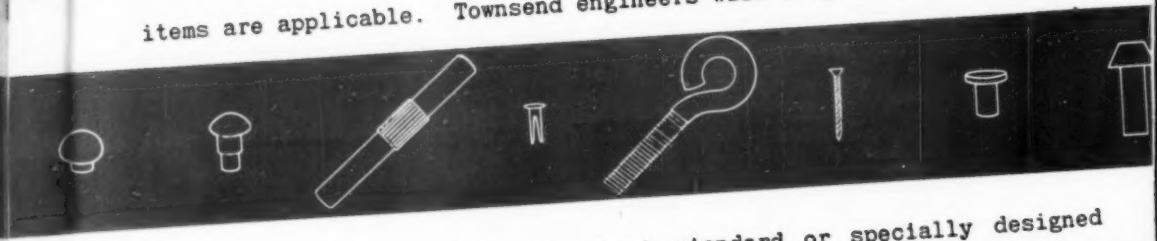
in your operations. Their economy has been proved in many industries



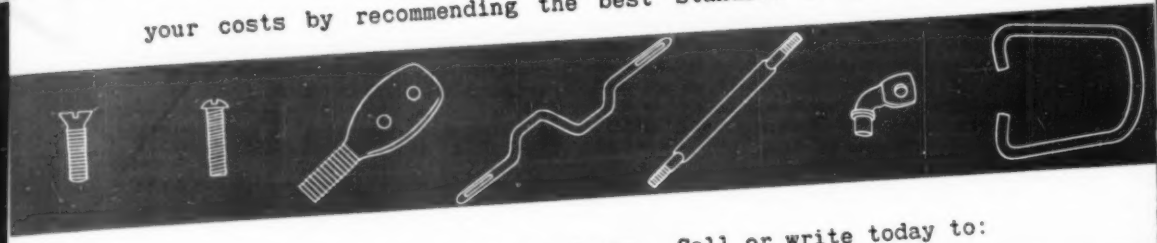
for use with a multitude of products where cold headed and roll threaded



items are applicable. Townsend engineers will be glad to help reduce



your costs by recommending the best standard or specially designed



fasteners and parts for your products. Call or write today to:

Townsend

COMPANY — ESTABLISHED 1816

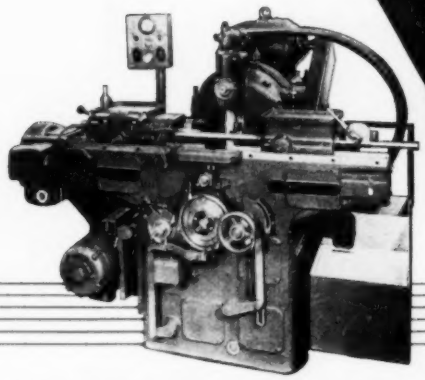
(Parts shown one-half size)

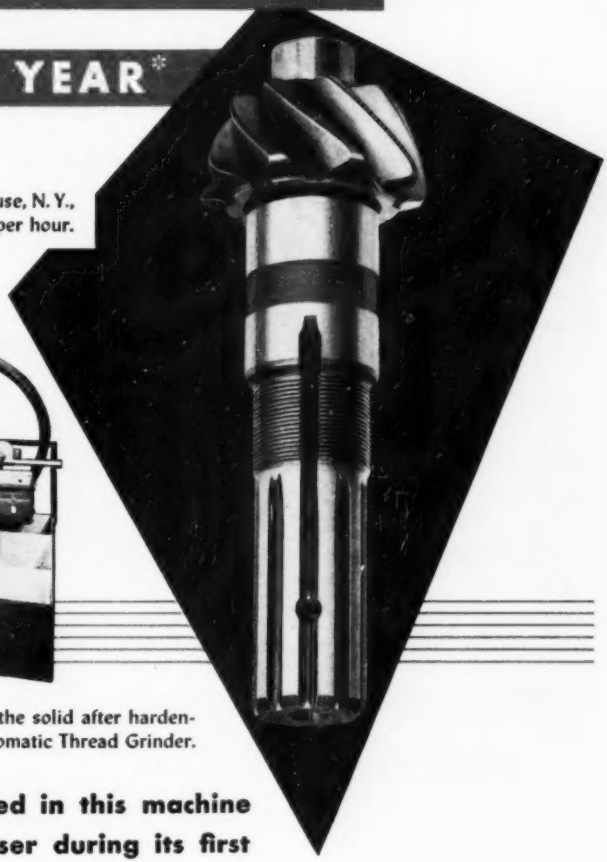
New Brighton, Pa.
Chicago 38, Ill.

110% DIVIDEND

THE FIRST YEAR*

The New Process Gear Corp., Syracuse, N. Y., threads 80 of these drive pinions per hour.





The threads are finish ground from the solid after hardening, on a 6 x 15" Jones & Lamson Automatic Thread Grinder.

110% of the funds invested in this machine returned to the purchaser during its first year of operation.

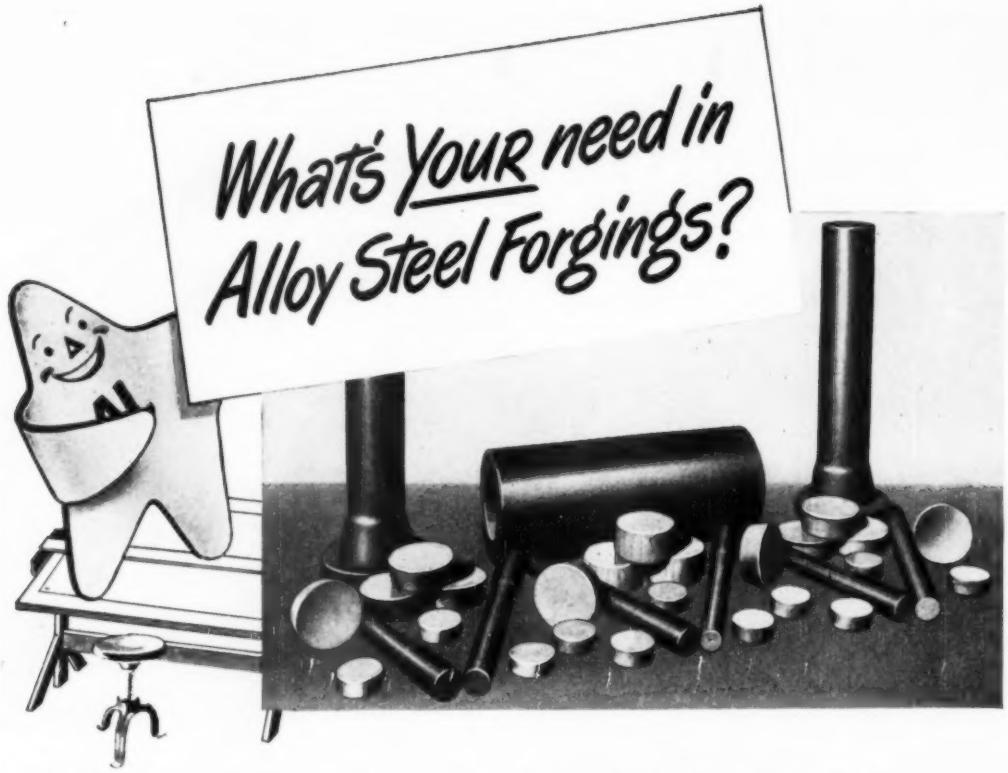
*The piece was completely machined, including the keyway in the thread diameter before hardening. A 6 x 15" J & L Automatic Thread Grinder, using a multi-rib wheel, grinds the thread from the solid, hardened pinion in two revolutions of the work piece, plus the feed-in and lap-over. Scrap was reduced 50%. The savings (based on a daily production of 700 units) in direct labor costs, overhead and gage cost, *paid for machine and equipment in 11 months.*

A survey of your turning, threading and inspection operations by our engineers, might well produce comparable results for you. Write to Dept. 710 G

Thread Grinder Division

J&L JONES&LAMSON MACHINE COMPANY
Springfield, Vermont, U.S.A.

MACHINE TOOL CRAFTSMEN SINCE 1835



We produce them in Tool, Die, Stainless SAE, or NE Steels -*Any Application!*

Write for New Booklet:

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Full information on the complete line of FCC Smooth Hammered Forgings . . . Rings, Hubs, Discs, Sleeves and other Forged Shapes; Intricate Shapes, Forgings for Hot Work Tools, etc.

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BROAD experience—over a period of many years—in forging tool and die blanks for almost every conceivable hot-work application has fitted our Forging and Casting Division to deal expertly with any problems that may arise in this exacting field.

Regardless of the kind of work to be done or material to be worked, we are equipped to furnish you with correctly made forgings of hot-work steel that will give you the utmost in effective performance.

Any Allegheny Ludlum field representative can give you further particulars; or get your copy of our booklet on "Smooth Hammered Forgings" (see description at left).

ALLEGHENY LUDLUM
STEEL CORPORATION
Pittsburgh, Pa.

Forging and Casting Division

DETROIT 20, MICHIGAN

W&D 1698

contact your local distributor

His name is listed in Union's THOMAS' REGISTER insert under the heading "Drills, Twist".

UNION TWIST DRILL COMPANY, ATHOL, MASSACHUSETTS

MILLING CUTTERS • GEAR CUTTERS • TWIST DRILLS • HOBS • REAMERS • CARBIDE TOOLS

We own and operate S. W. CARD MANUFACTURING CO. Division, Mansfield, Mass., Taps, Dies, Screw Plates.

BUTTERFIELD DIVISION, Derby Line, Vt., Taps, Dies, Screw Plates, Reamers.

BUTTERFIELD DIVISION, Rock Island, Que., Milling Cutters, Twist Drills, Hobs, Reamers, Taps, Dies, Screw Plates.

Can You Grind One Engine Block PER MINUTE?

BLANCHARD 16-A2 GRINDS TRACTOR CYLINDER BLOCKS CONTINUOUSLY

Here is a good example of mass grinding of larger pieces at a greater profit.

A four station mechanical clamping fixture, designed and built by Blanchard, continuously rotating on the 55" diameter chuck of a No. 16-A2 Blanchard Surface Grinder, presents the Engine Blocks to the grinding wheels.

The material is cast iron and .010" of stock is removed from each surface—*to a flatness of .0015".*

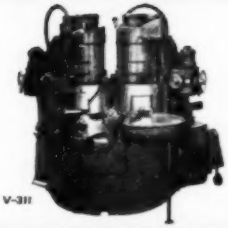
Production is 60 pieces per hour including loading and unloading time.

If you have larger engine cylinder blocks to grind, the Blanchard 22-A, with proper number of spindles, will do the job. Let Blanchard show you how.

PUT IT ON THE BLANCHARD

Whatever type of flat surface machining your parts may require—simple "cleaning up," rough grind and finish grind in one operation, or very flat surfaces with fine finish and held to close limits—there is no more profitable method, in most cases, than to "Put it on the Blanchard."

If you machine flat surfaces . . . bring your problems to Blanchard engineers.



BLANCHARD

The **BLANCHARD** MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

stop passing profits to the scrap dealer

Maybe you have been running antiquated machines so long that your President has come to expect a high write-off for spoilage as a normal production cost. But the "book savings" from operating old, amortized automatic bar machines can be quickly eaten up by the excessive costs of production rejects.

Perhaps a simple reminder—a few case histories on the experiences of some of our customers—will demonstrate to your top executives how the new Acme-Gridley Automatics can "up" your production profit.

We would be glad to send you more of these actual performance records, if you like—or prepare a specific machine recommendation to fit your individual needs.

CUT THIS OUT FOR USE WHEN YOUR PRESIDENT WANTS PROOF

AN ACME-GRIDLEY CERTIFIED CASE STUDY

THIS IS WHAT HAPPENED:

MACHINE—2" RB-6 Spindle Acme-Gridley Bar Automatic

PART TURNED—Sewing Machine Shuttle Blank

MATERIAL—SAE 1112 Bar Stock

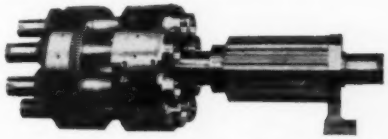
OPERATIONS—20, including pick-off and shaving back radius

TOTAL TIME PER PIECE—23 Seconds

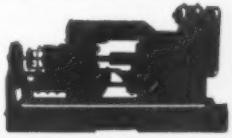
TOLERANCE—.002" between stem and inside wall

AND HERE'S ONE IMPORTANT REASON:

ACME-GRIDLEY SPINDLE CARRIER, designed with bearing surfaces two-thirds the length of headstock housing. A heavy bearing in the gear box section and the guide-arm, both supporting the stem end, provide a three-point bearing for the carrier system. This rigid support is a basic reason for sustained accuracy under heavy duty service. Carrier and stem are concentrically ground, by an exclusive National



Acme process, at one setting—to give basic positive alignment, for greater machining accuracy. The forged end tool sides are mounted around this hardened stem. Permanent alignment of the tools with the work is one of many important reasons for the precision, speed and long life of Acme-Gridley Automatics.



THE NATIONAL ACME COMPANY

170 EAST 131st STREET • CLEVELAND 8, OHIO

ACME-GRIDLEY BAR and CHUCKING AUTOMATICS built in 4, 6 and 8 spindle styles, maintain accuracy at the highest spindle speeds and fastest feeds modern cutting tools can withstand.

HENDEY
No. 2
GENERAL
PURPOSE
LATHE

Let's talk 'PRICE'

A good lathe costs money. The new Hendey No. 2 General Purpose Lathe is not an exception, but is an exceptional value. This lathe is an entirely new concept. It replaces the famous Hendey Cone Head Lathe, but retains all the facility – with a single lever belt shifter. It has eight speeds, but no expensive geared head. A unique feature eliminates belt pull on the spindle. There are 48 thread and feed changes, and graduations permit spindle indexing for cutting multiple threads. The Bed Ways, both Carriage and Tailstock, are hardened and precision ground. Here's a lot of lathe for the money – the price will please. Write today for details and catalog.

PRINCIPAL DIMENSIONS

Rated size	14"
Swing over ways	16 7/16"
Swing over cross slide	10 1/4"
Spindle bearings – Preloaded super-precision roller bearings	
Spindle nose	L-1 taper nose
Hole through spindle	1 1/2"
Range of spindle speeds	30 to 1142 R.P.M.
Carriage bearings on ways	21 1/2"
Width and length of cross slide	7"
Compound rest travel	4"
No. of thread and feed changes	48
Range of thread cutting	1 1/2 to 92

THE *hendey* MACHINE COMPANY

MAIN OFFICE & PLANT: TORRINGTON, CONN.

BRANCH OFFICES: New York, Chicago, Boston, Detroit, Rochester, Los Angeles, San Francisco

REPRESENTATIVES: Philadelphia, Cleveland, Pittsburgh

hendey

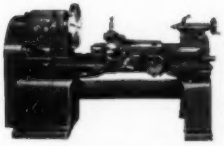
Sebastian GEARED HEAD LATHES

by KING

GENERAL PURPOSE LATHES
Available in
12", 16", and 20" Sizes

12"
GENERAL PURPOSE
LATHE

20"
GENERAL PURPOSE LATHE



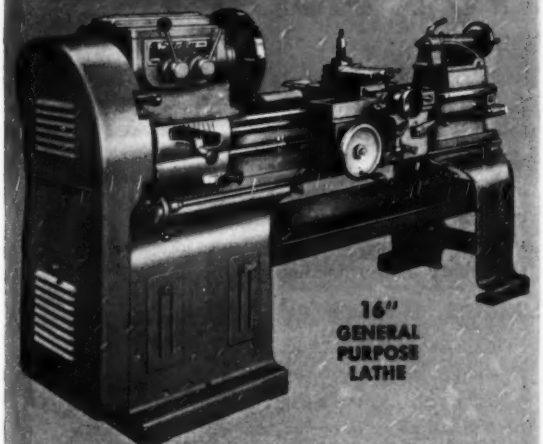
GAP LATHES
Made in 16" and 20" sizes

Also Clutch & Brake, Line Shaft Drive, and other Special Types

All Sebastian Lathes Are Equipped With 8-Speed Geared Head

give you a full range of types and sizes to meet your requirements

give you finer lathe construction . . . greater ease of operation . . . longer, more economical service life



16"
GENERAL
PURPOSE
LATHE

Before you buy your next lathe, it will pay you to investigate the new King-made, medium priced Sebastian. This outstanding lathe incorporates every big-lathe feature contributing to consistent accuracy and time-saving, labor-saving ease of operation. An unusually large number of items are furnished as standard equipment, included in the basic lathe price. And there's the right type of lathe, in the right swing size and bed length, to meet your particular shop requirements. For specifications and construction details, write now for new Catalog S-1 (Standard Type Lathes) and S-101 (Special Type Lathes).

KING MACHINE TOOL DIVISION

CINCINNATI 29, OHIO

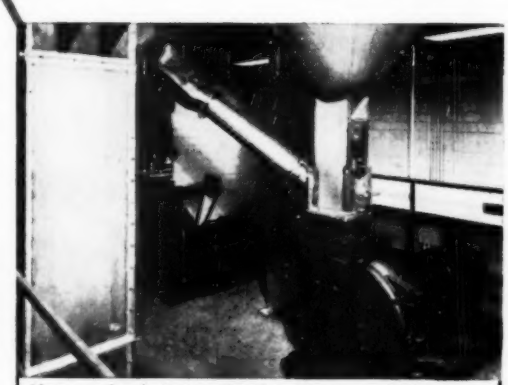
Builders of King Vertical Boring & Turning Machines and Sebastian Lathes

Second in a series of Unusual Grinding Wheel Operations

Even ASPIRIN has a headache!

● One of the toughest problems of aspirin manufacturers is to produce tablets that will disintegrate and "go to work" quickly. This is partly solved by grinding the dried mixture into the exact consistency before pressing the tablet.

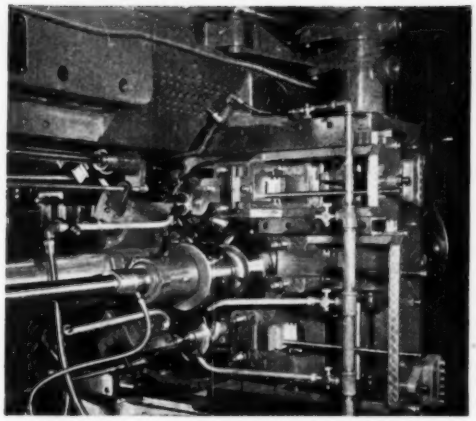
Whatever YOUR grinding problem may be, BAY STATE can solve it . . . fast. Possibly the exact specifications to meet your requirements can be supplied directly from large stocks either in Westboro, branch warehouses, or from our distributors strategically located throughout the United States. *Send us your grinding problems. We can help you.*



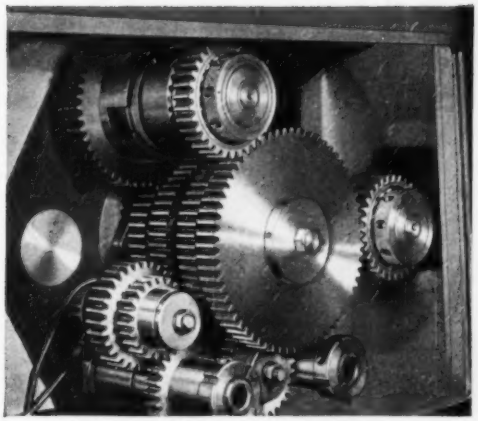
Photograph of Aspirin Grinder, Courtesy of The Bayer Company (Sterling Drug Inc., Successor)

BAY STATE ABRASIVE PRODUCTS CO.
Westboro, Massachusetts, U. S. A.
Branch Offices and Warehouses — Chicago, Cleveland, Detroit.
Distributors — All Principal Cities.

Top Performance Consistently Duplicated



Full Swing for Main and Auxiliary End Slide Standard and Special Tool Mountings



Cone "Full-Choice" Open End Attachment Drive

IS HALF A LOAF BETTER THAN ONE?

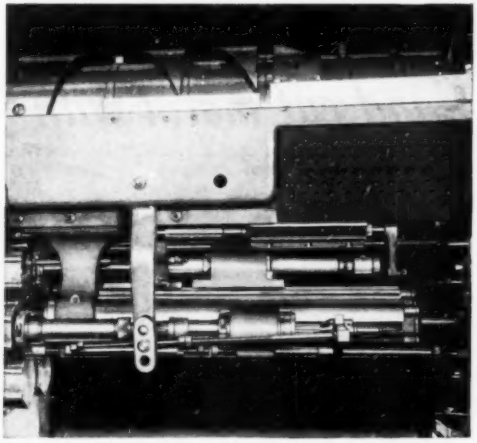
Machine capacity can usually be measured by tooling accommodation. The facility available to handle the job will determine a machine's dollar value.

Lack of a "full choice" accommodation of tooling positions for endworking tools and attachments can be a costly handicap to a multiple spindle automatic. The inability to swing to full collet capacity die heads, hollow mills, trepans, and internal necking tools, can limit a machine's usefulness on many jobs from zero up. Like half a loaf — better than none, but much less than one.

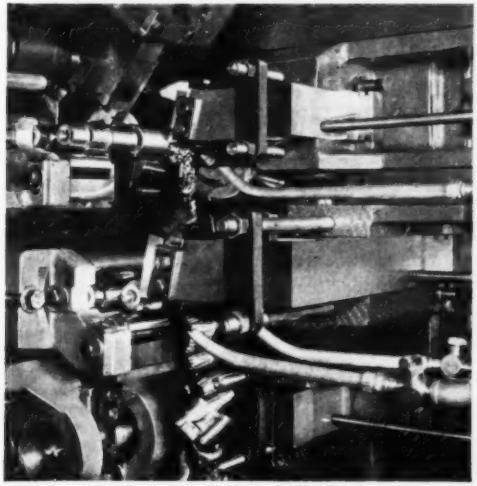
The "full choice" tooling accommodation of Conomatic cross slides, main end slides, auxiliary end slides and endworking attachment drive positions, are worth checking.

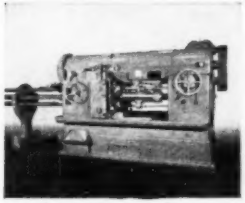
Write to Cone for Buyer's Chart which lists overall requirements of Multiple Spindle Automatics.

"All-Position" End Attachment Mounting



Standard Forming Slide and Auxiliary Cross Slide Facility





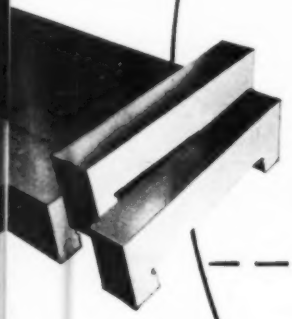
A comparison with ALL Automatics will lead you to

Conomatic

#6

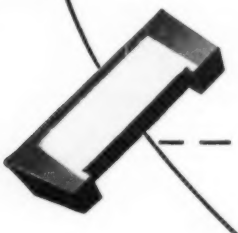
CONE AUTOMATIC MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.

How Hard are GISHOLT'S Hardened Ways?



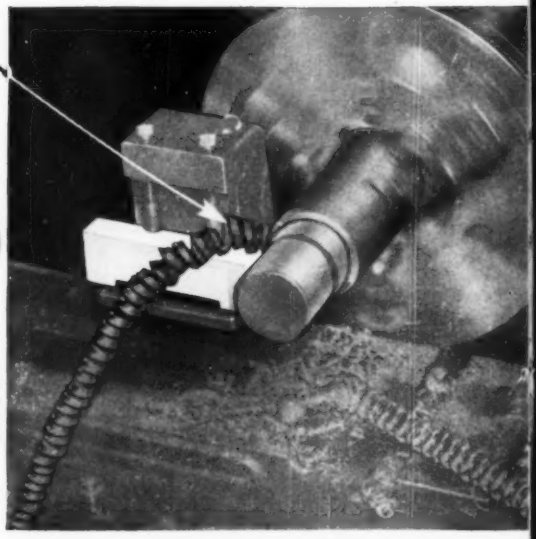
to show you . . .

We took a section from the bedways..



made it into a tool bit . . .

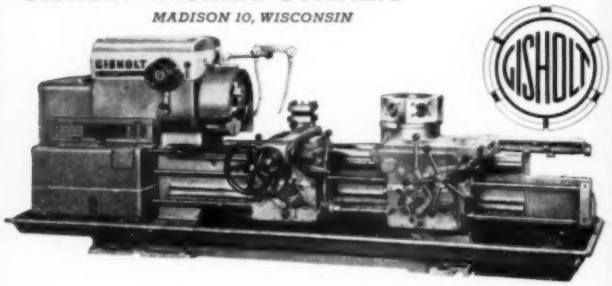
and cut metal with it!



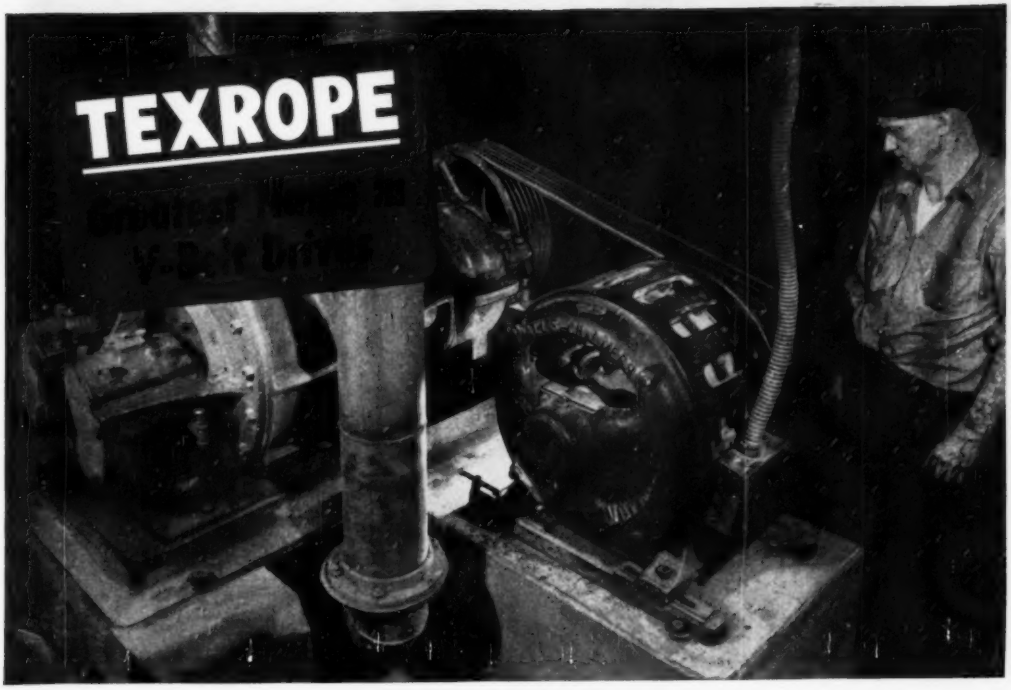
Here it is, turning a shaft of 1045 cold rolled steel. This illustrates how precision is "hardened" into Gisholt Turret Lathes with all working surfaces hardened to 64-66 Rockwell C on ways, gibs and clamps. This extreme hardness makes Gisholt ways practically wearproof—insures lifelong accuracy—the kind of accuracy you want specified in your next turret lathe.

GISHOLT MACHINE COMPANY

MADISON 10, WISCONSIN



TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS
BALANCERS • SPECIAL MACHINES



"No Upkeep Now"

BELT SLIP ELIMINATED, BEARING DAMAGE STOPPED, POWER WASTE ENDED WHEN *TEXROPE* V-BELT DRIVE REPLACES FLAT BELT.

CHIEF PLANT ENGINEER in this midwest plant says, "The old flat belt on this blower drive was twelve inches wide on twenty foot centers. Not only was it heavy but it also absorbed a lot of power.

"Besides that, dust made the belt slip constantly. We had to keep the belt so tight that it ruined bearings. And slipping would burn the belt. Maintenance on our old flat belt drive cost us hundreds of dollars every year.

"Four years ago an Allis-Chalmers representative recommended this *Texrope* drive. It doesn't slip at all, doesn't hurt the bearings and we haven't spent a cent on it. I wish we had changed to a *Texrope* drive years sooner."

Money-saving performance like this is one of the reasons why more *Texrope* industrial V-belt drives have been installed since 1926 — when Allis-Chalmers originated the multiple V-belt drive — than any other kind.

The *Texrope* line gives you practically everything you need for any V-belt drive . . . V-belts, standard and *Vari-Pitch* sheaves and speed changers . . . all from one reliable source. You can engineer 90% of all V-belt drives yourself with the help of the *Texrope* Pre-engineered Drive Manual. See your A-C Authorized Dealer or District Office or write for Bulletin 20B6956. Also in Sweet's.

Texrope Super-7 V-belts result from the cooperative research of Allis-Chalmers and B. F. Goodrich; and are sold only by A-C dealers and offices. *Texrope* and *Vari-Pitch* are Allis-Chalmers trademarks. A 2648

ALLIS-CHALMERS, 999A SO. 70 ST.
MILWAUKEE, WIS.

ALLIS-CHALMERS

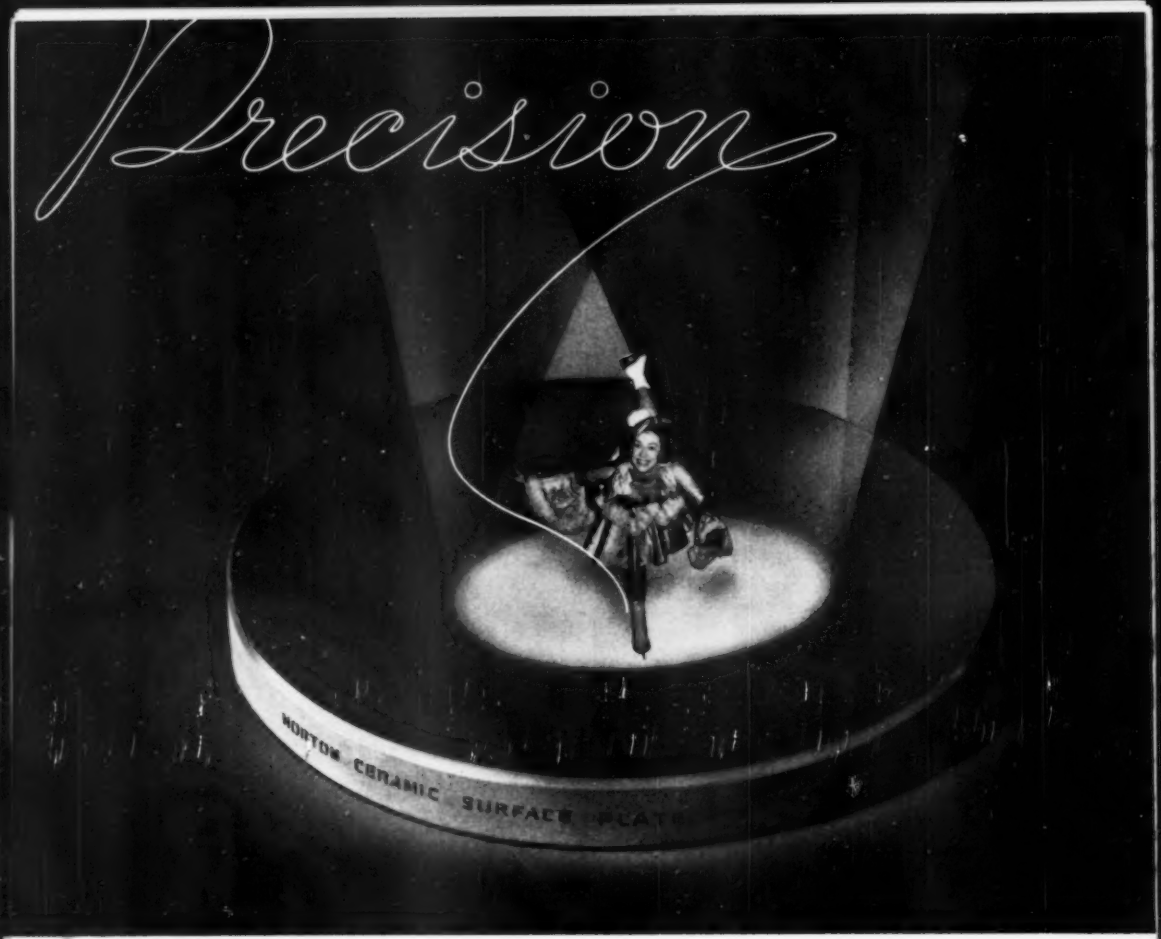
Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and District Offices throughout the country.

MOTORS — ½ to 25,000 HP and up. Matching Allis-Chalmers Control.

TEXROPE — Belts in all sizes and sections, standard and Vari-Pitch sheaves, speed changers.

PUMPS — Integral motor and coupled types. Sizes and ratings to 2500 GPM.



with Norton CERAMIC Surface Plates

NORTON COMPANY
Worcester 6, Massachusetts

PRECISION in manufacture—precision in use—"precision," the first word that comes to mind when using this first *ceramic* surface plate to be marketed. Made by specialists in wear-resistant materials and precision surface finishes, the Norton Ceramic Surface Plate has three distinct advantages:

1. *a longer-lived surface*
2. *a flatter surface*
3. *a smoother surface*

The wear-resistance of these ceramic surface plates is so high that no other type of surface plate can approach them. Furthermore, they will not warp or deform, will not sweat or corrode, will not deflect under load, will not give expansion troubles. Made of an extremely durable and stable material, free of strain, Norton Ceramic Surface Plates are guaranteed to be flat within .0001"; and they *stay flat.*

Smoothness of the ceramic surface permits rapid and easy movement of instruments and work across the plate. This prevents wear of expensive gage blocks, sine bars, instrument bases.

For more information on the longest-wearing, precision surface plates ever made—write: Norton Company, Worcester 6, Mass., for our free Bulletin No. 1174.

NORTON®

CERAMIC SURFACE PLATES

Butterfield 100% Inspected Tools

PUT ACCURATE THREADING CONTINUALLY ON TAP

in your plant

Accurate tapped holes help speed production because screws, bolts and studs can be driven in faster, more smoothly, with better holding qualities.

To insure accurate, uniform taps, Butterfield inspects *every* tap to be certain it's up to specifications. No hit or miss . . . job lot . . . or statistical inspection will do — *only 100% inspection can make quality certain.*

You can get Butterfield taps at a nearby distributor. He'll give you good service and recommend the right tap for the job you have in mind.

Checking Thread Form and Lead on a Hartness Comparator. Magnification 62½ diameters.

BUTTERFIELD DIVISION,
Union Twist Drill Co.,
Derby Line, Vermont, and
Rock Island, Quebec.

BUTTERFIELD

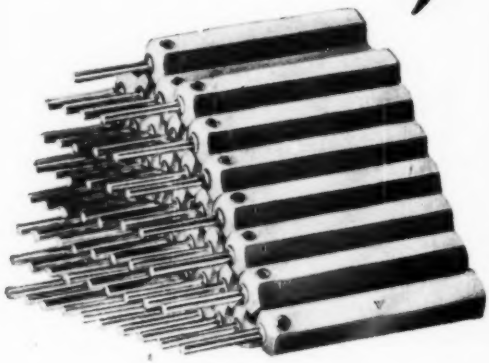
THE 100% INSPECTED TOOLS

Every Tool Individually Inspected

TAPS • DIES • REAMERS • SCREW PLATES

Van Keuren

CARBOLOY
Wire Type
PLUG GAGES
are the right answer



1 VK CARBOLOY=50 TOOLSTEEL GAGES

After considerable experimentation with various wear resistant materials, we have chosen Carboloy as being the most practical, durable and economical. Carboloy does not flake or chip easily and is quite suitable for wire type plug gages as small as .020" in diameter.

Wire Type Plug Gages were originated by the Van Keuren Co. in 1925 and are now recognized as the most economical gages for measuring small holes. The original wire type plug gages were made of tool steel—High Speed steel doubled gage life. VK Chromium Plate gave 5 times the life, and VK Carboloy 50 times the life of tool steel gaging units. All of these materials are still in use and have their particular applications.

VK Carboloy gaging units are made in sizes from .020" to .500" diameter. They are made only in the wire type design because this is by far the most economical plug gage. In cases where it is desired to use VK Carboloy wire type Go units with existing No Go taper insert units, special handles can be furnished for this purpose.

Van Keuren Wire Type Plug Gages assure longer lasting precision and lower gage cost, because the entire 2" length of gage can be used. When the end of the wire becomes worn, it is ground off. The wire type unit is securely held in the unit by a split bushing and a headless set screw.

VK Carboloy Wire Type Plug Gages are made to Class B accuracy, plus .00005" minus, .00000" on the Go unit and plus or minus .000025" on the No Go unit. Closer or wider tolerances can be supplied if desired.

On your next order Specify VK Wire Type Plug Gages: VK Carboloy for long runs because of the enormous saving in gage cost; VK Carboloy for fussy jobs because of the infinitesimal gage wear and insurance that the parts will be within the specified limits; VK Tool Steel—High Speed Steel—Precision Chromium for less exacting jobs. You will be assured of the best in accuracy, quality and delivery.

This 208 page volume represents 2 years of research sponsored by the Van Keuren Co.

It presents for the first time in history a simple and exact method of measuring screws and worms with wires.

It tells how to measure gears, splines and involute serrations. It is an accepted reference book for measuring problems and methods.

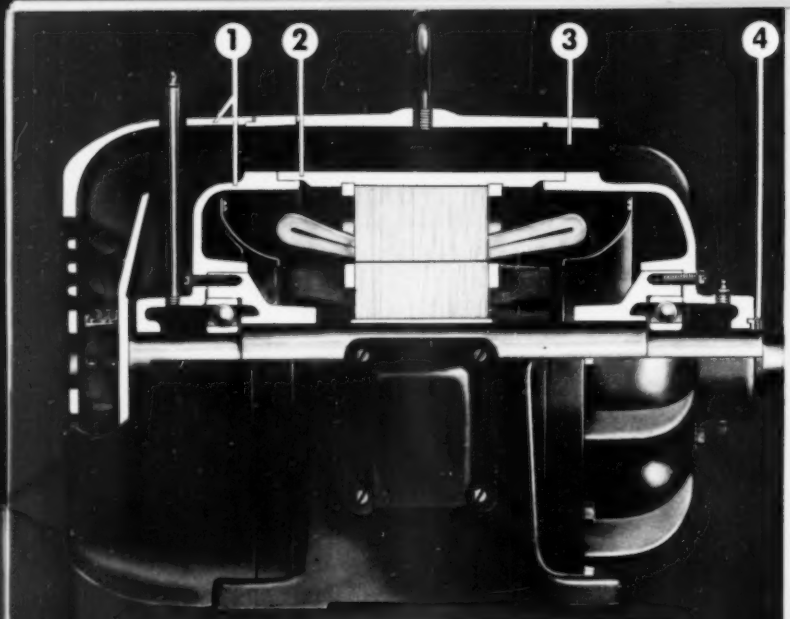
Copies free upon request.

THE Van Keuren CO., 173 WALTHAM STREET, WATERTOWN, MASS.

30th YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires

YOU CAN PUT A
TRI CLAD
MOTOR ANYWHERE
GENERAL ELECTRIC
HERE'S WHY



The standard totally enclosed Tri-Clad features a *cast-iron* double-wall structure (1) that keeps outside air from electrical operating parts . . . machined fit end shields (2) . . . large air passages (3), easy to clean . . . rotating labyrinth seals (4) that keep foreign matter from working in around the shaft. Note, too, the new corrosion-resistant G-E Textolite cooling fan is now standard on all 1- to 15 hp TEFC Tri-Clads.

You can put a *TRI CLAD* motor anywhere

YES SIR! The standard *Tri-Clad* open motor is a *cast-iron, dripproof* motor you can put anywhere that *any* open motor can be used—and in a lot of places where other open motors couldn't take it.

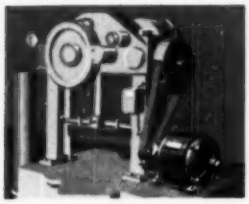
What's more, for the really dirty jobs—where air is laden with dust, or corrosive fumes—where metal chips and cutting fluids abound—the Tri-Clad totally enclosed motor gives you more protection, *inside and out*, than any other make of motor you can buy.

1,720,000 Tri-Clad motors, operating in every conceivable kind of plant, prove the far-reaching advantages of cast-iron construction . . . superior resistance to corrosion . . . rigidity that makes for permanent shaft alignment . . . inherent damping action that minimizes noise and damaging vibration. These motors prove, too, that Tri-Clad double-end ventilation simply has no equal for prolonging an open motor's useful life. Providing high-volume, relatively low-velocity cooling, this ventilating system keeps Tri-Clad motors *uniformly* "air-conditioned".

WANT MOTORS THAT CAN REALLY TAKE ABUSE? Tri-Clad motors in nearly all types and ratings are available for **IMMEDIATE SHIPMENT.** Contact your nearest G-E Office or write *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

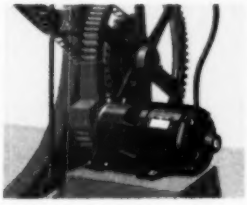
GENERAL ELECTRIC

There's a Tri-Clad motor for every industrial need!

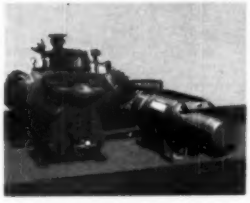


G-E open (drippproof) induction motors for constant-load, constant-speed applications. From 1 to 2000 hp.

G-E totally enclosed motors for outdoor operation, in abrasive dusts, or corrosive fumes. From 1 to 1000 hp.



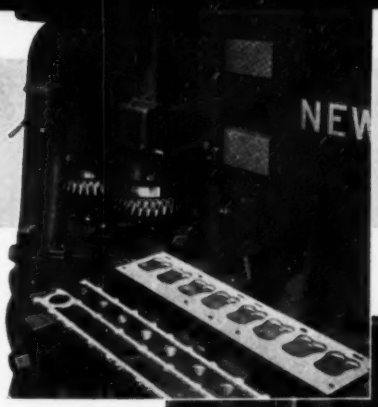
G-E gear-motors for low-speed operation. A normal-speed motor with built-in reduction gear. From ⅛ to 75 hp.

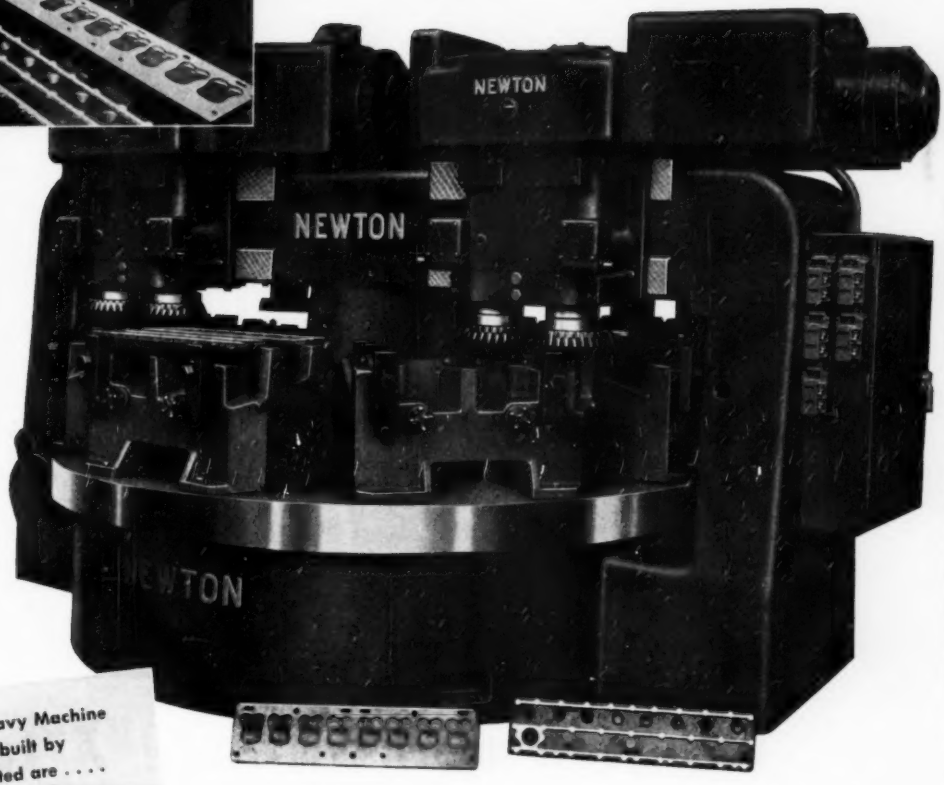


G-E synchronous motors for maintaining exact speeds or for correcting power factor. From 20 to 1000 hp.

YOU CAN'T BEAT
TRI CLAD
EXTRA
PROTECTION

NEWTON EIGHT SPINDLE TWO STATION UNIT HEAD ROTARY CONTINUOUS MILLING MACHINE





Among Heavy Machine Tools built by Consolidated are . . . .

LATHES
BORING MILLS
DRILL PRESSES
MILLING MACHINES
BORING MACHINES
COLD SAW MACHINES
BORING, DRILLING AND MILLING MACHINES
DRILL AND TOOL GRINDERS
PLANERS
SLOTTERS
RAILROAD SHOP TOOLS
AUTOMOTIVE TOOLS
AND OTHER SPECIAL MACHINES

Designed for high production milling of automotive cylinder blocks and heads, transmission cases and similar parts, this machine provides new rigidity and power for today's cutting materials. It is equipped with two sets of roughing and two sets of finishing spindles. Operating stations on both sides of the machine make possible twice the productive capacity of the conventional single station machine.

For full information send for Bulletin No. 650

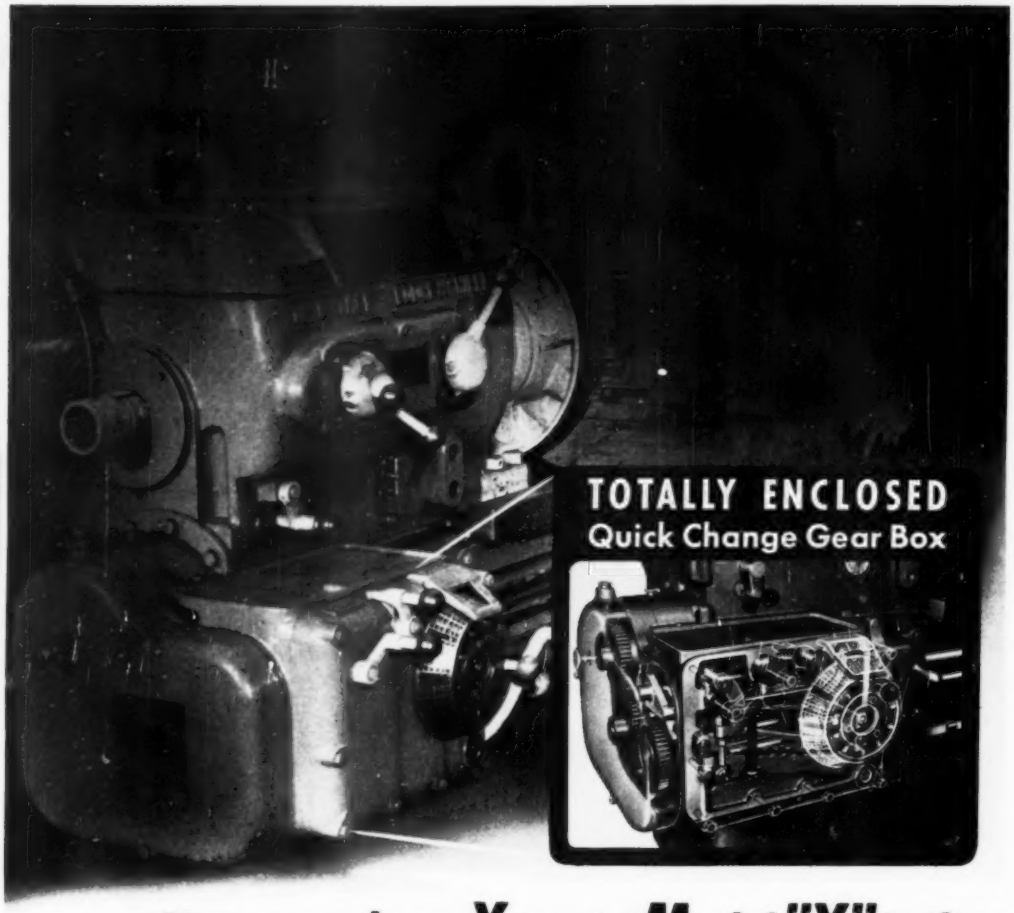
BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

BETTS • BETTS-BRIDGEFORD • COLBURN • HILLES & JONES • MODERN • NEWTON • SELLERS

CONSOLIDATED MACHINE TOOLS

CONSOLIDATED
MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK



Gives you these *Xtras* in *Model* "X" Lathes

The TOTALLY ENCLOSED, dial-operated QUICK CHANGE GEAR BOX on Lodge & Shipley Model "X" Lathes gives finger tip control, instant selection of 55 Threads and Feeds. One of the outstanding lathe developments of the past 50 years, this feature was originated by Lodge & Shipley . . . has now become a "must" for those who have profited by its advantages.

Only on Lodge & Shipley Model "X" Lathes is the TOTALLY ENCLOSED Quick Change Gear Box available in every lathe size, another contribution to lasting accuracy and greater operator efficiency. Look for this outstanding feature on the next lathes you buy. Write for Bulletins No. 676 and 679 which show 14, 16 and 20-inch Model "X" Engine Lathes.

THE **Lodge & Shipley** COMPANY
MACHINE TOOL DIVISION • 3055 COLERAIN
SPECIAL PRODUCTS DIVISION • 800 EVANS ST.
CINCINNATI 25, OHIO

Model Xtra Life—**because the Quick Change Gear Box is TOTALLY ENCLOSED, sealed against dirt, chips, abrasive dusts and tampering, this important mechanism cuts downtime, assures much longer service life.**

Model Xtra Convenience—**because the TOTALLY ENCLOSED Quick Change Gear Box offers finger tip control of 55 feeds and 55 R.H. and L.H. threads, operation is quicker, easier and more profitable.**

Model Xtra Lubrication—**because the Quick Change Gear Box is TOTALLY ENCLOSED, automatic recirculating lubrication is used. Lubrication is not dependent upon the operator. All bearings and gearing are fully lubricated, protected against wear automatically.**

a REVOLUTION
IN DIE CASTING!

New Lindberg-Fisher 2 Chamber Melting Furnace revolutionizes die casting methods. Typical users throughout the country say:

Floyd J. Kamin, President, Kamin Die Casting & Mfg. Co., says: "On this job our new Lindberg-Fisher Induction Melting Furnace turns out twice as much work as a conventional gas furnace with the same melting capacity—and rejects have decreased 65%. We operate continuously, and we find that cost is actually less than with a gas furnace of the same melting capacity."

Edward L. Kornayzer, Kamin Plant Supt., says: "The furnace operates much cooler and operator fatigue is practically eliminated."

Roe F. Reed, President, Reed Metal Crafts, says: "We're more than satisfied with our Lindberg-Fisher melting furnace. We've ordered another and plan to install more in the future."

The Chief Engineer of a well known Chicago manufacturer of aluminum and zinc die cast products says: "Working conditions for our operators have been greatly improved because of lower temperature in the immediate area of the furnace. Furnace shell is so cool that you can touch it with bare hands. We also find that molten metal is noticeably cleaner and dross loss is considerably reduced.

Here are some of the many reasons why *you, too,* will want a Lindberg-Fisher 2 Chamber melting furnace in your plant . . .

Double Chamber permits simultaneous cold metal charging and ladling . . confines impurities to the charging chamber . . . provides gentle magnetic fluxing . . reduces metal losses.

"Channel Flushing," new patented feature flushes channels twice a minute eliminating channel clogging. Automatic temperature control is amazingly precise—permits the lowest possible casting temperatures. Cool operation improves working conditions.

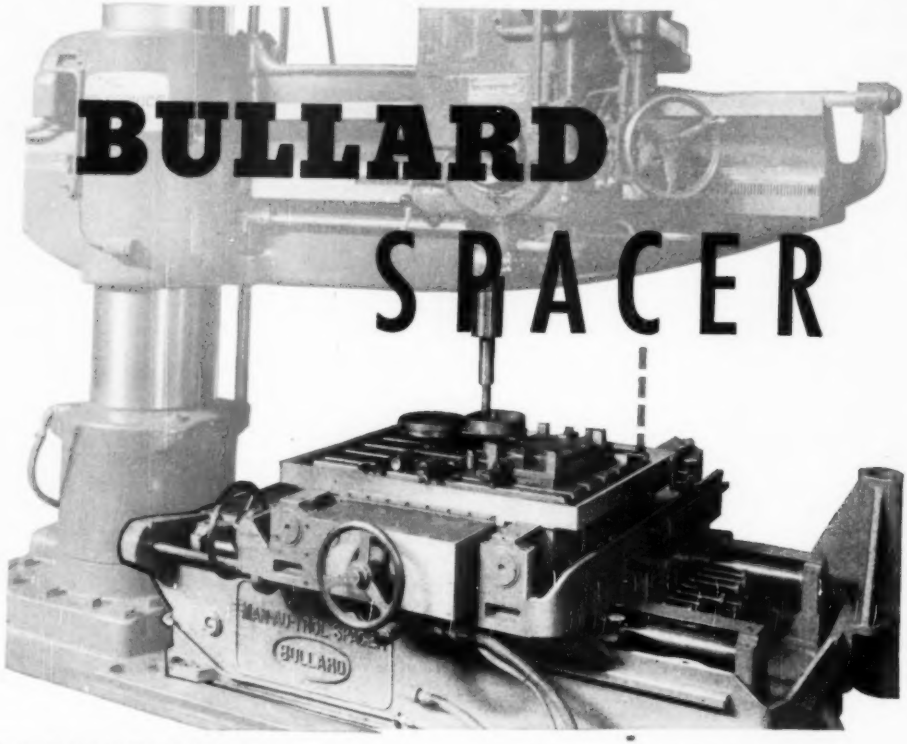
Write for the address of the Lindberg-Fisher installation nearest you. See the furnace in operation, hear for yourself how the men who run them feel about this revolutionary new furnace.

LINDBERG-Fisher MELTING FURNACES

Lindberg Engineering Co., 2445 W. Hubbard St., Chicago, Ill.

NEXT MONTH—Hand ladling will soon be obsolete. Completely automatic nitrogen ladling. Look for our advertisement.

BULLARD SPACER



ELIMINATES . . .
Hole-Locating Jigs and Fixtures

This unit applied to radial drills having accurate drill spindles, is proving a highly successful cost reducing method for drilling short or long run jobs without the need for expensive jigs or fixtures.

It is competitively accurate and in many cases faster than conventional jig borers.

Drilling, boring, reaming and tapping operations have been speeded up and costs reduced by many users of this equipment.

To meet the future economic pressure investigate this manufacturing method. Ask BULLARD Engineers about satisfied users. Write today.

Illustrated...
30 x 20 SPACER

— Bullard 30 x 20 Spacer processing three different parts in one set up. All pieces located within ± .0005. Such a set up is especially profitable on small lot production.

THE BULLARD COMPANY
BRIDGEPORT 2, CONNECTICUT

BULLARD

Where success depends on accuracy...

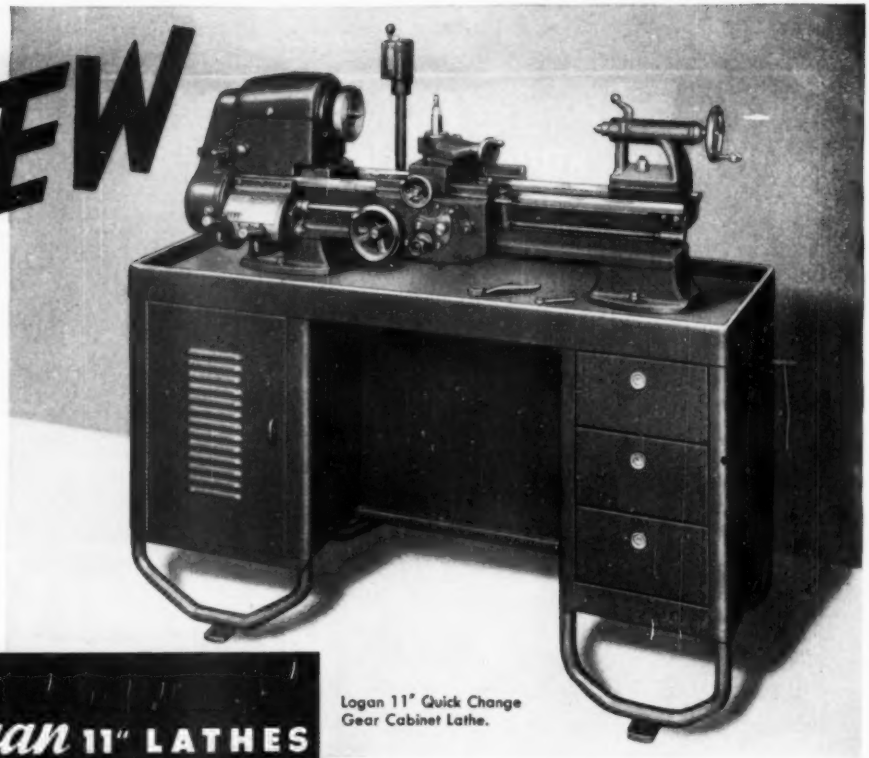
Production men the world over turn to Jacobs Chucks as naturally as the die maker to his instruments when *precision* is prerequisite to success. Their powerful grip holds tools tight and true...their rugged construction maintains accuracy over a long service life. The Jacobs Plain Bearing Chuck has long been the world-wide favorite as original equipment with manufacturers of portable tools and drilling machinery. Stocked by your Industrial Supply Distributor. The Jacobs Manufacturing Company, West Hartford 10, Connecticut.

If it's a JACOBS, it holds

FOREMOST IN CHUCKS · FIRMEST IN GRIP

Jacobs Chucks

NEW



Logan 11" Quick Change Gear Cabinet Lathe.

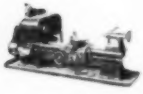
Logan 11" LATHES

1" COLLET CAPACITY,

24" and 36" BETWEEN CENTERS

Specially developed to meet the needs of industry, shops and schools, the new Logan 11" swing lathes combine Logan advanced design and quality construction with new, increased capacity, added precision, and improved performance. Of particular importance is their low price range in the field of lathes with comparable specifications.

Logan 11" Quick Change Gear Floor Lathe



Logan 11" Quick Change Gear Bench Lathe

Logan 11" Floor Model Quick Change Gear Turret Lathe

FOR LARGE WORK... The new Logan Lathes have 11" swing, 1" draw-in collet capacity, 1⅜" spindle hole, and center distances of 24" and 36".

FOR ACCURACY... Precision preloaded ball bearing spindle mounting assures sustained accuracy at any speed from 45 to 1500 rpm without adjustment. The two V-ways and two flat ways of the rugged beds are precision ground to a tolerance of .0005" along the lineal capacity of the lathe. The run-out of a test bar inserted in the spindle is held to a tolerance of .0005" total indicator reading at a point 12" from the bearing.

FOR DURABILITY... Rugged overall construction provides the stamina for years of hard use with a minimum of maintenance and a maximum of sustained accuracy. Self-lubricating bronze bearings protect against wear at 35 points where ordinarily bearings are not used.

FOR LOW COST... Low initial cost, low operating cost, low maintenance, quick set-up, high production, versatility and accuracy all contribute to the economy of the new 11" lathe. You can buy no other lathes of comparable specifications and quality at the low Logan price.

Available in bench, floor, cabinet and turret models.

WRITE FOR DETAILED INFORMATION ON ALL LOGAN 9", 10" and 11" LATHES AND 8" SHAPERS

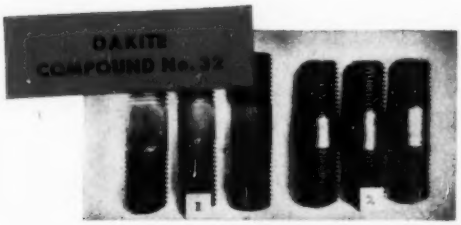
LOGAN ENGINEERING COMPANY

4901 WEST LAWRENCE AVENUE • CHICAGO 30, ILLINOIS

LOOK TO Logan FOR *BETTER* LATHES AND SHAPERS

Corrosion is electrolytic action which causes ferrous metals to break down into oxides known as rust. The cost to you and industry? Almost six billion dollars a year. But with the Oakite anti-rust program you can . . .

Cut your rust costs 3 ways



Rust-covered bolts, at left, shown clean and derusted at right, after Oakite derusting treatment.

Forged and machined stock, spray-coated for in-storage protection against rust.

Record-changer bases are CrysCoated before painting for anti-rust protection.

OAKITE methods and materials for combating rust are sure in action, low in cost. Used as directed, Oakite Compound No. 32, an inhibited acidic material, removes rust and scale without brushing or scraping . . . without harming metal. Merely immerse parts, then neutralize and rinse—rust is gone.

To prevent indoor rust on work in process, parts or assemblies in storage or in transit, use Oakite Special Protective Oil. Leaves a semi-permanent, thin oil film which provides adequate protection against corrosion. Applied by dip tank, spray or brush, Oakite Special Protective Oil displaces moisture on metal surfaces; drains and dries quickly. Easy to remove. Economical because thin film covers large areas . . . has high dilution ratio.

Ferrous parts ready for painting may be rust-protected by means of the Oakite CrysCoat Process. Applied in machine or tank, this widely used pre-paint treatment not only retards under-coat corrosion, but cleans and phosphatizes metal for tight paint grippage. Also localizes corrosion if paint is scratched.

Write Today for detailed facts about the Oakite 3-way anti-rust program. No obligation.

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Technical Service Representatives in Principal Cities of U. S. & Canada

OAKITE

OAKITE 1909 1949 40 ANNIVERSARY YEAR

Specialized Industrial Cleaning
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CIMCOOL covers 85%

OF ALL METAL CUTTING OPERATIONS

Figure on Cimcool® to take over 85% of all metal cutting operations in your plant. This revolutionary cutting fluid replaces all water emulsions and all but a few highly compounded specialty oils. Cimcool not only does the job—**it does a better job.**

Cimcool is different—a **chemical emulsion**—that combines friction reduction and cooling capacity in a degree never before attained. You get longer tool life, less down time. Cimcool lasts longer in the machine, too, reduces the cost of cleaning and changing. And Cimcool permits faster speeds. One test run will convince you!

Write for free booklet, "Cimcool Gives the Answers." Address, Sales Manager, Cimcool Division, Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

®Trade Mark Reg. U. S. Pat. Off.

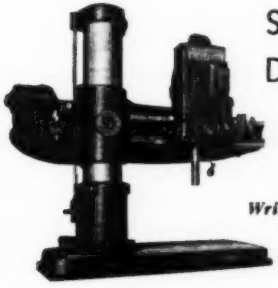
A Production-Proved Product of
THE CINCINNATI MILLING MACHINE CO.

for 85%
OF ALL METAL CUTTING JOBS

It's all done here

1. Instant change of 36 spindle speeds by three close-set handy levers—on the head.
2. Eighteen feed changes are instantaneously made by two adjacent levers—on the head.
3. Power, column clamping and unclamping is controlled by two convenient push buttons—on the head.
4. Arm elevating and automatic clamping is controlled by a single lever—on the head.
5. Power rapid traverse of head in either direction by single lever—on the head.
6. Start, stop and reverse spindle by one lever—on the head.

At the finger-tip every control is always handy for the operator. His time is conserved and productivity increased. Correct, safe manipulation is easy on Cincinnati Super Service Radial Drills.



Write for Bulletin R-29

THE CINCINNATI BICKFORD TOOL CO.
RADIAL AND UPRIGHT DRILLING MACHINES
SUPER SERVICE

Radials 7½" dia. col. 2½" arm, to 26" dia. col. 12" arm.
General purpose Uprights 21" to 28" sizes.
Production Uprights 21" to 28".
Jig Borers Portable Horizontals.
Spacing Table Machines

Equal Efficiency of Every Unit Makes the Balanced Machine

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.

A portion of the stock room in a Danly assembly branch where component parts of Danly die sets are stocked awaiting assembly to your specifications. It is this specialized service that is so much a part of Danly's facilities that help you save time and avoid production delays.

you save time 3 ways using...

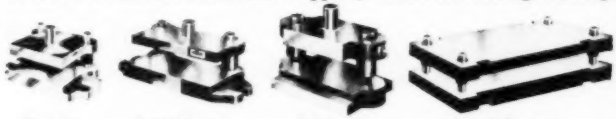
DANLY *Precision* Die Sets

1 Precision Insures Long Die Life . . . Cuts Downtime

The more highly controlled accuracy of Danly Precision Die Sets results in longer production runs between die regrinds. Stamping quality and uniformity are also improved.

Guide posts and bushings of each Danly Precision Die Set are ground and lapped with final lapping of bushings after assembly. Assembled accuracy is inherent. This means accurate die closure in the press setup, giving you longer die life and lower production costs.

2 Wider Selection of Standard Types, Plus Interchangeability



Regular Back-Post Set | Long Narrow Back-Post Set | Standard Center-Post Set | Large Special 4-Post Set

Consult the Danly catalog for a wider variety of standard types of die sets. For example, in any one of the many types, there are several thousand interchangeable combinations, each to suit specific needs. Interchangeable replacements, including any single component of the die set, offers substantial savings in time, giving you flexibility and worthwhile economy.

3 Danly Nationwide Assembly Service Speeds Deliveries

Assembly plants are located in major tool and die centers. Here, variety and prompt service are available to your door . . . a real saving when time is important . . . use the Danly branch in your area to save time and reduce costly delays.

Call on the Danly Branch nearest you

Assembly plants listed below (marked with stars) stock interchangeable parts for quick assembly and delivery of any standard die set to suit your specifications.

- * **Chicago 50,** 2100 S. 52nd Ave.
- * **Cleveland 14,** 1550 E. 33rd St.
- * **Dayton 2,** 990 E. Monument Ave.
- * **Detroit 16,** 1549 Temple Ave.
- * **Grand Rapids,** 113 Michigan St., N.W.
- * **Long Island City 1,** 47-28 37th St.
- * **Los Angeles 54,** Ducommun Metals & Supply Co., 4890 S. Alameda
- * **Milwaukee 2,** 111 E. Wisconsin Ave.
- * **Philadelphia 44,** 18 W. Chelten Ave.
- * **Rochester 4,** 16 Commercial St.

DANLY

DANLY MACHINE SPECIALTIES, INC.
2100 SOUTH 52ND AVENUE, CHICAGO 50, ILLINOIS

25 YEARS OF DEPENDABLE SERVICE TO THE STAMPING INDUSTRY

PRECISION DIE SETS...STANDARD AND SPECIAL • MECHANICAL PRESSES AND PRESS EQUIPMENT

SPOT NEWS OF METALWORKING

"Phantom orders" for cutting tools are now being placed by the National Security Resources Board. These orders can be converted into firm orders by telegram in case of a national emergency. Similar orders for machine tools were distributed some months ago.

Continuous strip mill to roll magnesium sheet is reported under consideration at Washington, construction to be financed by government and operation to be in private hands. Widespread use of magnesium sheet in military equipment makes such a mill desirable in event of war.

An undistributed profits tax bill is being readied by Rep. Wright Patman. It is held out as bait to business in place of a boost in the corporate income tax, probably to 50%. Marriner Eccles, former Federal Reserve Board chairman, favors such a tax.

Allison Division of General Motors has received a $90-million contract for heavy-duty hydraulic transmissions and is reported tooling for this job.

A new-type nut which will lock and stay tight in spite of excessively high temperatures has been developed by an Indiana company. The nut can be released by about 300 in.-lb. torque wrench and spun off the bolt with one's fingers. Same nut can be used again, spun on with fingers and set with 400 in.-lb. torque wrench.

New 550-hp. V-12 four-cycle diesel engine, under field test for two years, has just been announced by Cummins Engine Co. It is claimed to be lightest-weight diesel for its power (8.3 lb. per hp.) now available.

Delays in tooling up for Chevrolet torque converter will hold up its introduction until late fall when the 1950 cars are expected to be announced.

Some cars with an "All-State" nameplate on them are in the experimental room of an independent automobile company. Detroiters link this fact to the current reports that a prominent mail-order house may begin again to merchandise cars.

Financing of new and used machine tools is being done by Commercial Credit Co. on a non-recourse basis to the seller. Minimum down payment is 25%, exclusive of installation and transportation costs. Charges range from $31.50 on six-month terms to $123 on 24-month terms for each $1,000 of financing. Minimum charge on any deal is $60. Machinery Dealers' National Association is publicizing this financing plan.

Brazilian industry is typified by high percentage of small shops which cannot use modern engineering techniques, hence productivity per worker is very low, states Abbink report (Joint Brazil-U.S. Technical Commission). Productivity suffers in many larger plants because of poor factory layout, use of obsolete machinery, and absence of product standardization.

Automobile companies find it expedient to lay up bank of parts so old models can be kept in production while tooling is proceeding on new models, rather than shut down as they formerly did. Reason is they are assessed unemployment compensation by State of Michigan on basis of past performance. One week's shutdown a year ago cost one maker over $250,000. With today's rates and employment, cost would exceed $500,000 for similar closing.

Guided pilotless missiles geared to travel 1200 to 1500 mph will be used by 1960, according to pioneer aircraft designer John Northrop. Also an "interceptor" guided missile, rocket-powered, will almost completely replace manned fighter craft by that date, serving as sole defense against long-ranged missiles.

Gaging Metalworking

Metalworking manufacturers are watching eagerly for evidences of a seasonal pick-up in demand. But it now is believed that the improvement may be somewhat less than hoped for.

This does not mean that metalworking is not proceeding on a big scale. Activities continue considerably more than double the 1939 volume, in hours worked, in units made. However, operations from here on will be governed strictly by actual sales. Inventories will be pared wherever possible, and future commitments for materials and component parts will be on a cautious basis compared with the policy which has prevailed since the end of the war.

Upturn in Export Orders

The big news in the machine tool industry is the sharp upturn in export orders. In February foreign bookings comprised 26.6% of the total volume, or the largest percentage since July, 1946. It rose to that level from 21.9 in January and from 16.2 in December. The improvement is in contrast with the depressed state of export business during 1948.

▶ It now is estimated that ECA-financed machine tool orders, which in large part have accounted for the recent export gains, may reach $75 million for the current calendar year. If orders from other segments of the world are added on, the combined foreign bookings in 1949 may run as high as $100 million.

After a flurry of purchases, ECA-inspired buying appears likely to fall off temporarily until funds become available for fiscal '50.

February Business Below January

Though this revival of export demand is of special gratification to the machine tool industry, business in the aggregate during February was below January. The new orders index of the National Machine Tool Builders' Association puts the preliminary figure for February at 81, as against 87 in January. Shipments rose slightly, to 70.4 from 68.8 (the index is based on average shipments in 1945-1947). Ratio of unfilled orders to shipments as of March 1 was 4.7 to 1.

▶ The trouble is that machine tool business is very badly distributed throughout the industry. Most shops in the Cincinnati district are down to 32 hr. a week. The same condition holds in New England. Plants around Cleveland still are on a 40-hr. week. Inquiries are numerous and are being followed up aggressively, but builders are having difficulty in converting a reasonable percentage of them into orders.

Uncertainty as to labor, tax and other national legislation affecting industry is reported the major factor in holding up machine tool sales.

Metalworking Index Off

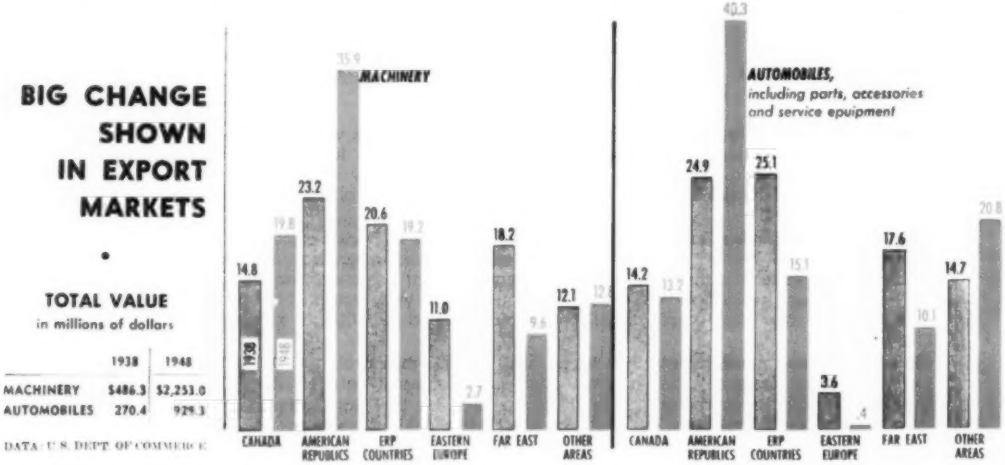
AMERICAN MACHINIST index of metalworking production declined to 216 during February. That compares with 221 in January and 227 in February of last year.

The automotive industry was hardest hit, with a drop-off of 11 points. In the "other metalworking" classification, representing a variety of products, the decrease totaled 9 points. Worst slump in February, as against February, 1948, was in automobiles—23 points.

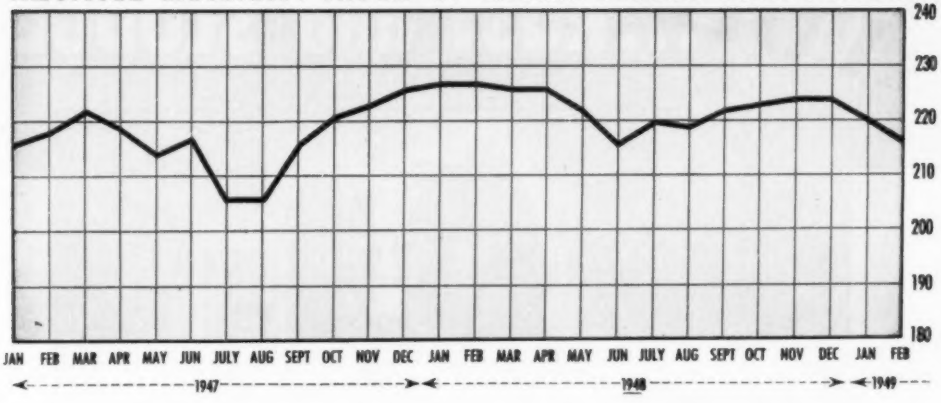
February naturally reflected a seasonal trend. March figures are not yet at hand, but at least a small gain is anticipated. The index for April will be the tip-off as to how much of the recent decline has been merely seasonal and how much is due to a readjustment in business.

Cutting Tool Prospects Good

Cutting tool manufacturers are doing reasonably well. In some cases, sales volume is running ahead of last year's. Customers are reluctant,



American Machinist INDEX OF METALWORKING PRODUCTION



INDEX	COMPONENTS				
	MACHINERY	ELECTRICAL MFG.	AUTOS, TRUCKS	TRANS-PORTATION EQUIP.	OTHER METAL-WORKING
Feb. 1949 (preliminary) 216	240	216	225	303	145
Jan. 1949 (revised) .. 221	243	227	229	303	154
Feb. 1948 227	250	239	238	289	156

AMERICAN MACHINIST'S INDEX OF METALWORKING is based on manhours worked in five segments, which are "weighted" as follows: Machinery, 32.5—Auto & Trucks, 22.6—Electrical Manufacturing, 15.4—Transportation Equipment, 12.4—All Other Metalworking, 17.1. Index figures are a percentage of 1939, which equals 100.

however, to purchase more than current requirements and, in main, are paring their inventories. Some makers say that they still expect to come up to the end of the year with a better sales record than in 1948.

▶ Contract tool and die shops are struggling to keep volume anywhere near the total in the same period a year ago. Both January and February figures were off considerably from 1948. Spotty conditions exist. Shops in New Jersey, Massachusetts and in the Philadelphia area are better off, but the opposite is true in New York and Connecticut. Detroit is pretty flat. Some new orders are showing up from customers making consumer products, who are bringing out new models. It is the kind of business that tool and die shops have been looking for during the past year. Rearmament work has been negligible.

Steel Production Sets Record

Raw steel production has been kept at an all-time peak. For 10 weeks the industry operated above the theoretical capacity of its facilities. The coal strike had little if any influence upon steel output.

This record output of raw steel, plus heavy production of finished steel, has helped ease the whole steel situation. In an amazing turnabout, long predicted by veteran steel people, many steel products recently in a seller's market are definitely in a buyer's market from now on.

▶ Gray markets have about disappeared. The need for conversion steel deals is rapidly fading. Demand for alloy steels has receded somewhat with some companies reporting the necessity for shutting down electrical furnaces temporarily.

The fact is, though, that all the sheet and strip steel that can be rolled for weeks ahead is fully engaged. The same situation applies in plates.

Zinc followed lead in a price decline, the second nonferrous metal thus to be affected. Official price now is 16 cents a lb. for prime western grades. Buyers are hesitating to place long-term orders, feeling that prices may go down further.

Refrigerators in Demand

Household appliances are being produced at a high rate, but cutbacks have been announced in a number of items by several companies. Also, retail price reductions have been put into effect on refrigerators as well as ranges and other products.

Westinghouse states that it will reduce output gradually in a number of appliance lines, the decrease ranging from 12 to 30%. Refrigerators, however, will not be included. Refrigerators continue to be in greater demand than other appliances.

Rise in Unemployment Slows

Federal experts on employment expect April, May, and June will see employment rising—as business activity picks up. They look for a peak of at least 60 million jobs in July.

Last year at that time, a high point for overall employment, the number at work reached 61.6 million people. With a larger labor force this year, it would be possible to go still higher—but the peak will depend on business activity in the summer months.

Unemployment in February has been reported by the Census Bureau at 3.2 million—but the more-than-usual-seasonal rise in joblessness has tapered off. If the trend goes as experts expect it to, the high point will be March, when about 3.5 million may be out of work. After that, the trend should reverse itself.

AVOID...RUST and SLUDGE

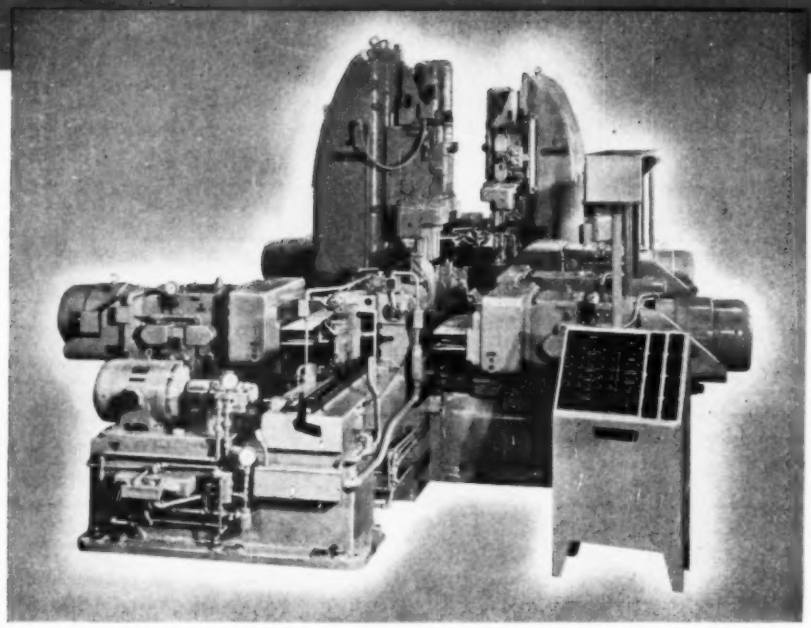


Photo courtesy the Foote-Burt Company

Keep hydraulic systems clean by using Texaco Regal Oils (R & O)

RUST and sludge make trouble. Keep 'em out of your hydraulic systems by using *Texaco Regal Oils (R & O)*. These turbine-quality oils have special rust and oxidation inhibitors and effective anti-foaming properties. Users say they assure "smoother operation," "reduced down-time," "much better performance than anything used in the past."

Yes, the proved ability of *Texaco Regal Oils (R & O)* to inhibit rust and sludge formations means an extra margin of operating safety . . . greater dependability . . . fewer production interruptions . . . lower maintenance costs.

You can get *Texaco Regal Oils (R & O)* in proper viscosities for every type and size of hydraulic mechanism. Leading manufacturers recommend *Texaco Regal Oils (R & O)* . . . and many ship their units charged with them.

Let a Texaco Lubrication Engineer help you get maximum efficiency and economy from all your machinery. Just call the nearest of the more than 2300 Texaco Wholesale Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd St., New York 17, N. Y.

TEXACO

TEXACO Regal Oils (R&O)

FOR ALL HYDRAULIC UNITS

Tune in . . . TEXACO STAR THEATRE every Wednesday night starring Milton Berle. See newspaper for time and station.

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

A Three-Point Training Program

There is a fallacious theory that in this mechanical age, skilled shop men no longer are needed. If an operator is smart enough to be able to push a button to start a machine, everything is supposed to be automatic from that point on.

Along with this misconception is the opinion among some educators that if an engineer is taught theory, that is enough. They feel that college curricula no longer can allot time for the engineering student to get his hands dirty in familiarizing himself with machines and what they do.

If the current trend should continue, eventually we may wind up with a top layer of theorist engineers and a bottom layer of push-button workers, with nothing much in between. And the gap between the two layers will be a yawning one.

It is time that we halted this trend, because if it continues without some brake being put on it, we are heading for serious trouble.

The truth is that never have skilled men who know all about machine-tool operation been so essential as today. They are not required to run the machines. Instead, they are needed to keep the machines running.

Breakdowns of complicated machines, which are an integral part of a production line, are extremely costly in lost time and lost production. The skilled men's job is to maintain machines so that they do not break down and if trouble happens, to repair them as quickly as possible. The efficiency of maintenance crews is in direct proportion to the skill of each man.

In addition to more skilled men in the shop, industry requires more supervisors and production management men with knowledge beyond that which they can get just in the shop. As production becomes more mechanized and more complicated, these officials should possess a broader training than heretofore. This training should be both in theory and in shop practice.

Finally, the engineers who design and develop products and who plan production should have an education beyond that which classroom theory teaches them. They should know machines intimately, and should be able to operate them and have some practical experience with them. For further discussion on this point, see the lead article in this issue beginning on page 85.

These observations bring us to these inevitable conclusions:

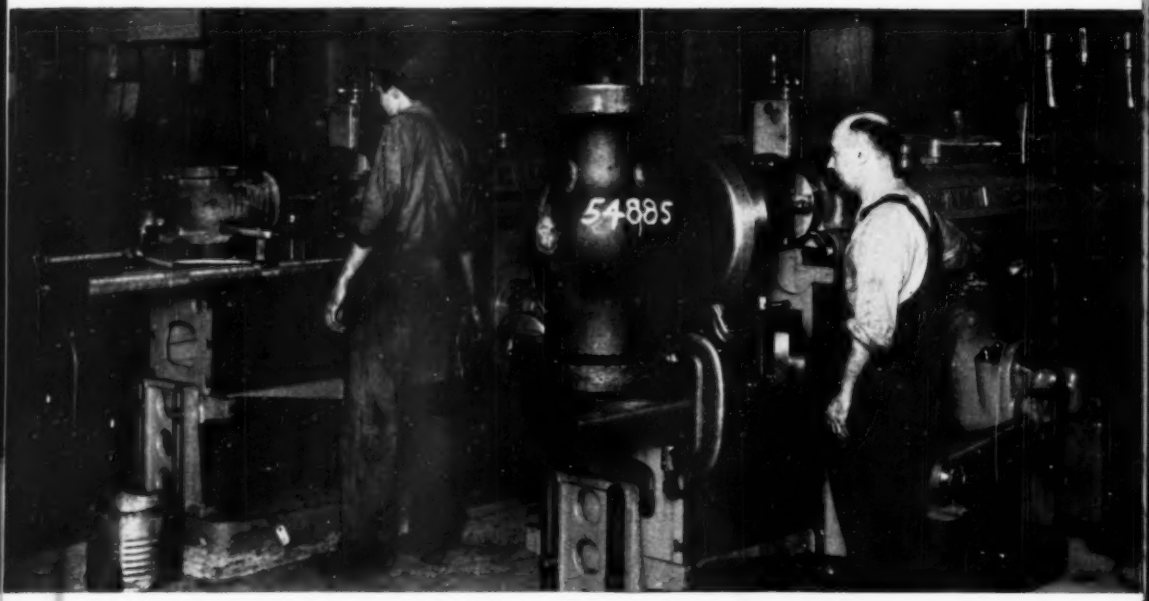
1. More apprenticeship courses are needed if the nation's metalworking industries are to have an adequate supply of all-round skilled machinists. Such courses should have the financial support and the active help of metalworking manufacturers and trade associations.

2. More technical schools below the four-year college level are needed. Our universities already are turning out enough white-collar graduates. Industry needs men of management calibre for the lower-echelon jobs. These men should properly be trained in schools primarily with an industrial atmosphere.

3. Our engineering colleges should give their students some sort of shop training along with the theory. Such training would be a "down-to-earth" experience for the students. Both students and industry would benefit after the students get out into jobs in industry.

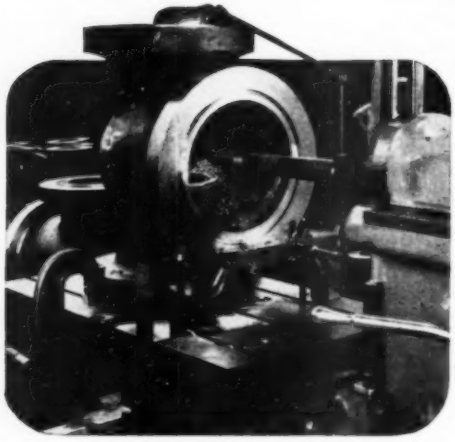
Burnham Finney

EDITOR



Photos—Courtesy William Powell Co., Cincinnati, Ohio

Internal Shaping...



Here is a 32" Cincinnati shaping the guides on a 10" class 600-lb. flanged end gate valve body. Cut length is 16"; feed, .010".

SOLVED THE PROBLEM Internal shaping is the answer to a long list of "hard-to-get-at jobs." The illustration shows two Cincinnati Shapers of a battery of ten machines shaping both male and female valve guides at the William Powell Company.

MANY SIZES Valves ranging from small 8"—150 lbs. pressure to 30"—2500 lbs. pressure, weighing well over 1000 lbs., are rapidly and efficiently handled.

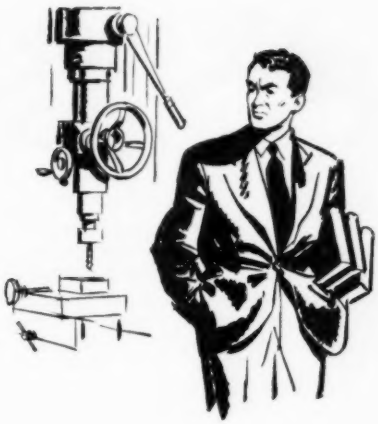
SIMPLE TOOLING Extension tool holder and high-speed bits cost relatively little. Cincinnati supplementary tables permit rapid setups for the larger valves. Low-cost operation is combined with a high production efficiency.

Write for Shaper Catalog N-4 for complete description of Cincinnati Shapers.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES



ARE NEW M. E. GRADUATES THEORISTS?

Pressure from many directions, plus obsolescence of equipment and courses, has caused many engineering colleges to abandon—or shorten—their shop courses. One editor sees breakers ahead . . .

BY E. J. TANGERMAN, MANAGING EDITOR, AMERICAN MACHINIST

". . . A great many engineers, like myself, have had very scanty preparation in the machine-tool field and only a casual contact with machines in industry. Such engineers often find themselves confronted with problems dealing with machine tools . . ."—M. E. PROFESSOR, NEW ENGLAND

". . . We do not give any instruction in shop work as we used to do, and as other engineering schools still do. In fact, a few other engineering schools are no longer finding space in their curricula for shop instruction because of the great pressure to devote their time to other subjects. This may be a mistake in policy . . ."—M. E. PROFESSOR, CALIF.

". . . Unfortunately, engineering colleges base their curricula largely upon suggestions made to them by representatives of large organizations. Actually, the majority of our graduates do not go with the very large organizations, but are employed by smaller companies . . ."—DEAN OF ENGINEERING, MIDWEST.

THESE extracts from three letters received the same day from educators tell their own story, one that bodes no good for Metalworking. In essence, the facts are these: Engineering curricula are becoming increasingly crowded as the fields of engineering become more complex. Colleges, faced with demands for additional and more specialized courses, as well as more English and "humanities," have inevitably squeezed down—and in some cases, *out*—the shop laboratory courses. Wartime speedups and round-the-calendar school sessions accelerated the trend. Most college shops are "basic"—a euphemism for a conglomeration of hopelessly obsolete simple machine tools, still belt driven, and worn so badly they are incapable of accuracy. Shop buildings are worn out too.

Faced with this situation, deans of engineering schools and boards of trustees are reluctant to take the inevitable and eventual step to a five-year course or to graduate training before a professional degree. Facing present-day costs of equipment and building construction and demands for engineering graduates, it is easier to rationalize that industry likes to provide its own shop training and thus to cut it out of the curriculum.

For many years, engineering graduates, their employers and their arts-graduate friends have criticized engineering curricula for their specialization—their narrowness, if you prefer. Engineers have been a tongue-tied lot, handicapped in taking their rightful place in society by their lack of background in arts and letters. Invidious comparisons have been drawn with men in the other professions. Curricula have provided no time for the humanities if they were to include the essential engineering subjects. But alumni and students have pressed for more such subjects.

Coupled with this has come tremendous development and broadening of each engineering field so that "mechanical engineering," for example, is an omnibus classification. Once the fundamentals are covered, there is little similarity in the technical courses required for a well-rounded background in such sub-industries as aircraft, railroad, diesel, refrigeration, and ma-

rine; or such functional subdivisions as design, production, plant, administration, cost accounting and the like. To obtain time for specialized courses and some humanities, lengthy shop courses have been progressively whittled down.

Wartime acceleration stripped engineering courses to skeletons in both subjects and total time. The nation was crying for graduate engineers, so short cuts were instituted. At war's end, the flood of veterans far exceeded the normal capacities of colleges. Classes are being held 12 or 14 hours a day; "institutes" where a limited number of the engineering and required subjects are taught have been set up in industrial localities. Thus students may halve their actual time *on the campus*—an important factor to the married veteran of 24 or 25. Further, with the student population at two to four times the prewar figures, neither laboratory space nor personnel is sufficient. And, back of it all has been machine shops equipped with ancient machine tools.

Representatives of major employers, very aware of the contrast between this archaic equipment and that in their own plants, very conscious of their crying need for engineers, have been impatient of the need for time-taking shop courses. Educators, in their anxiety to meet present needs and to get older men through their courses, have listened to these arguments.

What is the result? College graduate engineers enter production or engineering departments equipped with theoretical training, but with no practical background to give it perspective. They do not, particularly in small companies (where half of the graduates—or more—go), dare to confess their ignorance—or so they think—and they attempt to round out their educations surreptitiously. That leaves the door wide open for dissension between worker and engineer, for costly blunders, for magnification of evils traditionally assessed to "book-learning" engineers.

These are not theories. The conditions are borne out by the experiences of many companies with recent graduates, engineers who are expected to be management men tomorrow. Executives say that modern "degree men" don't know what it's all about—that men who have come up through the shop, with the aid of correspondence

". . . replacement of obsolete machine tools and modernizing instructional methods . . ."

or "night-school" courses (the latter in those selfsame institutes mentioned earlier) are frequently more suited for positions of responsibility—and are getting them. These latter are men who have "learned to do by doing," who have been able to combine theory and practice as they went along, thus giving perspective to both. These men—and the graduates with shop experience—know that the world doesn't owe them—or anyone else—a living; that a living must be chiseled out by hard work. Most important of all, they do not cherish any delusions of superiority—they can go from grease-ball to white-collar man and talk as equals to either.

What can be done about the problem? Lengthening courses or requiring additional work in residence is one answer. The cooperative educational system is another. But the basic need is modernization of archaic shops and reinstatement of shop laboratory training in some form approaching reality. This requires, in turn, replacement of obsolete machine tools and modernizing instructional method in shopwork as other courses have been modernized.

Alert universities have already gotten many tools from military surplus—at prices ranging from the freight to freight plus 15% of cost price. These colleges are modernizing their shops and continuing shop courses, thus are winning the cooperation of some equipment builders. They are suggesting masters' degrees rather than bachelors' —adding humanities too. Their graduates will, when confronted with production, personnel or planning problems, have the basic knowledge necessary for intelligent handling. What will graduates of the other colleges do? And what will the plants that have employed them do?

HERE'S WHAT THE EDUCATORS THINK OF THIS PROBLEM

WE PRESUMED to send our initial remarks to deans of all listed American colleges with engineering courses—some 105.

The response was overwhelming. To date we have replies from more than 60, most several pages long, many enclosing opinions from associates as well. All but a few take sides. Data on courses and equipment are tabulated at the rear of this issue of *American Machinist*; here are typical general points made in the letters:

A Fundamental Problem

The question of shop or no shop is part of a more basic one: Just what should constitute college training? S. W. Dudley, Dean of Engineering at Yale, makes some telling points for "no shop" advocates in discussing the basic problem. Says he: "I am a little disturbed by some of your statements, because 'knowledge' *isn't* power; power resides in what is done with knowledge. There seems to be much danger in emphasis wholly on techniques. Some is imperative, but let's not try to load the intellect with too much of what the nerves of habit can do better."

And again: "A. N. Whitehead has written: 'Education is the art of the utilization of knowledge.' You are quite right in calling attention to the

current vast acceleration in the growth of knowledge, especially technical knowledge—*facts*. This in itself suggests the need for great caution and the wisest insight in deciding what knowledge to offer for acquisition in the art of its utilization and, on the part of the student, for thoughtful consideration of the purpose and possibilities for *him, individually*, of the work he decides to do in college."

Again: "Technical and specialized schools or *curricula* may be the answer (to the squeezing out of shop courses—*Ed.)*, e.g., U. of Cincinnati, Northeastern and others who specialize in the training of which you are speaking. Excellent to have such schools—I wish there were more of them. State universities need to give more attention to technical specialization, no doubt, than endowed universities. Having the latter chiefly in mind, I do not see the spectre which seems to lurk between your lines. Education, after all, is for the *whole man*, to give him the mental material, and exercise in use, as far as college can make it available, so that he may know *what* he knows, *where* he must start (at the bottom always, if without experience) and, with confidence in his ability to learn details necessary for his immediate purposes, tackle the job with insight, determination and appreciation of the human as well as technical problems confronting him."

For the Humanities

Spokesman for the exponents of humanities in education is James Kip Finch, Dean of Engineering at Columbia. His solution is to drop "practical" courses. His opinions:

"Engineering school graduates are becoming more 'theoretical,' if by this term you mean more thoroughly grounded in their understanding of and ability to apply fundamental principles and basic knowledge in mathematics, in natural and engineering science. The supposed difference between 'theory' and 'practice' in engineering, it always seems to me, has been misunderstood. An engineering education must be directed toward 'know-how'—that is use—rather than toward the mere accumulation of knowledge. Science for science's sake is O.K. for the worker in natural science, but knowledge for man's sake better reflects the attitude of the engineer..."

"I agree that there is a tendency in this development to emphasize planning and designing and to soft-pedal doing. I also agree that we must maintain a reasonably close contact between planning and designing and doing . . . even in engineering education . . . But our schools do not claim to turn out fully competent designers of mature experience and judgment. All we can expect to do is to start out students on the right track—with the right fundamental knowledge and the right approach and attitude of mind. Most of the required experience must come later . . . It would be foolish, therefore, for us to attempt to make our students competent in the manual skills . . ."

"There can be no question, I believe, that in earlier days our engineering schools overemphasized this so-called practical training in technical skills—just training without education, the 'how' without too much of the 'know.' Some still do."

"How is the student to get not alone this approach . . . but at least some of the contact with construction or manufacturing methods essential to at least a beginning in intelligent design? My answer would be: Not through extensive shop courses but largely through summer employment during school years and apprenticeships after graduation."

"I am not over-excited by your statements on the possible lack of large, up-to-date student shops in engineering schools. In a trade school or technical institute, yes. But in an engineering school I regard them with suspicion . . ."

". . . another problem which you have, I think, not mentioned in your paper. How may machine processes be improved? My answer would be: Through exactly the same sequence of events, the same evolution in techniques by which engineering has improved all the other practical arts . . . namely, the replacement, the rationalization of older empirical, rule-of-thumb, qualitative practices by more exact, mathematical, scientific, quantitative procedures. Let us be honest. There are unfortunately relatively few 'practical' men who have the necessary understanding and knowledge of basic modern engineering mechanics, physical metallurgy, statistical and other modern tools of analysis to tackle this job. To which I might add that few if any of our young men who do possess these modern tools have the essential practical experience to tackle the job. The shortcomings of the former are, however, beyond repair—you can't teach old dogs new tricks—but the latter can and do become familiar with the practical aspects and needs of the problem. What progress would we hope for in the machine industries without the aid of this new generation of 'theorists'?"

For Shop Courses

Among strongest advocates of shop courses is Dean A. A. Potter of Purdue, which is also largest of our engineering colleges. Here is his opinion:

". . . about four-fifths of American engineering college graduates find their life work in industry. At least half of them will have their careers in small companies, where a person cannot be too specialized. I am convinced . . . that it is possible for us to include considerable instruction in manufacturing processes and the use of tools. The four-year undergraduate program is sufficient for the inclusion of the scientific, humanistic, and social science subjects.

"The difficulty arises from the fact that people now have an erroneous idea that most of our graduates will find their life work in the fields of research. Actually, less than 10% have anything to do with research or development. Also, very few of our graduates become consulting engineers—possibly 4 or 5%. I have always felt that there are enormous opportunities for the engineering graduate in small, as well as in large, plants, if he knows materials, processes, tools and machines. I feel that in the years ahead we shall have to make up our minds that more of our graduates are going to have jobs in plant engineering and in maintenance, production and operation of engineering enterprises; also that the work formerly carried on by master mechanics who developed through the shop will have to be taken over by some of our college graduates . . . Few engineers are employed by small companies because the ordinary college graduate has not the ability to utilize his knowledge for the benefit of an organization which cannot afford to have too many specialists.

"The above reasons have prompted me to insist that the engineer from Purdue must have some contact with shops. We changed the name and now call it 'manufacturing processes.' We have also changed the names of our shops, and call them 'machine process laboratories.' The fact remains, however, that they are shops."

Opinion Is Divided

The majority of our replies indicate strong belief in the value of shop courses, to provide a practical base for engineering, fundamental knowledge of how parts can and should be made—even to "get the student's hands dirty" (what during my apprenticeship we called "rubbing his nose in cutting oil" to teach the working man's point of view). But there is wide variation of opinion on when the courses should be given, how long they should be, and how they should be taught.

Most colleges have shortened shop courses somewhat, a number have cut out or drastically shortened foundry and patternmaking, a high percentage have shifted the emphasis from "shop" to "materials processing." It is rather generally agreed that the aim is not to train skilled mechanics, but to give students a knowledge of machines and processes. Some do it by lectures, with

or without movies, sound slide films and demonstrations—in some cases because equipment is inadequate or lacking. More let students do fundamental operations, demonstrate more difficult ones. A few spread their facilities and simulate industrial conditions by operating "production shops" in which freshmen act as shop labor, sophomores as foremen and upperclassmen as executives — and have correspondingly more extensive courses. Some concentrate shop in the freshman or sophomore year; others spread it—or spot it later.

To the familiar cooperative plan followed by such schools as Cincinnati, Northeastern and Georgia Tech have been added two other types—one in which the student has a special summer shop course either at the college itself or in industry, the other in which the student is given credit for summer or other shopwork in an approved shop—providing he writes an acceptable report.

Opponents of shop courses point out that the social sciences and humanities cannot be learned conveniently after college, while practical skills can be; that there is little reason why a student should pay to learn things he can actually be paid for learning (by industry, of course); that there just isn't time for everything and that the real need is to provide fundamentals rather than specialization. (They consider shop work a specialty.)

Some Opinions:

"Our engineering faculty are very convinced that such shop training is a necessary fundamental phase of the education of engineers. We believe that it should be given early . . . courses are required in the Freshman year of all engineering curricula . . . I have gained the impression, in talking to several deans of engineering in recent months, that several engineering schools are seriously considering re-establishing shop courses . . . which had previously been abandoned"—J. E. Hannum, *Ala. Polytechnic Institute.*

"There was a time when engineering curricula contained a large proportion of shop courses called wood shop or patternmaking, forge shop and machine shop. About a dozen years ago I inspected for accrediting an engineering college in which nearly 20 semester units of such work were required. Accrediting was unhesitatingly refused because the course was terribly out of date . . . Although we think the work in shop is important, we know that some of the best engineering colleges in the country, including the Calif. Institute of Technology, teach no shop work, and it is debatable whether the graduates of that institution or of ours are better equipped to meet the problems that confront them after graduation."—G. M. Butler, *U. of Ariz.*

". . . shopwork as it was taught, and is still being taught in many schools, was practically worthless as a training for an engineer; in other words, machine-tool operation as such simply is not engineering. But a knowledge of what the machines are, what they will do, the tools . . . is good engineering knowledge, and it is on this basis that shopwork should be taught. The Armour Institute some years ago dropped shopwork and made a study of its need . . . It was re-instated, but with a different emphasis."—F. H. Thomas, *U. of Buffalo.*

Suggests High Schools

"Present graduates *are* theorists . . . the present system of engineering education is very different from that in vogue when many older engineers were in college. Engineering has and is still progressing from a purely technological field to a profession. Many jobs formerly filled by engineers are now capably executed by technologists . . . It is recognized, however, that if a student takes a course in strength of materials and design, he will profit more from the course if he also has a practical point of view obtained through experience or technological training. This basic training could certainly be obtained before entering engineering school. Shop processes from the standpoint of familiarity with basic machine tools can best be given by high schools . . . Specialization (for aircraft, diesels, design or production, etc.—*Ed.*) is certainly to be frowned upon since the basic engineering of all these fields is the same. Courses exclusively concerned with a particular field or industry may eventually place many students in a difficult position. The majority of students . . . do not have a clear idea as to what field of engineering they wish to make their profession."—D. S. Clark, *Calif. Inst. of Tech.*

"There has been a large increase in the amount of technical information necessary to give the student in courses involving the solving of problems and design work. Such courses have replaced the older shop courses to a large extent . . ."—R. E. Vivian, *Univ. Southern Calif.*

"Case has attempted to avoid stripping our engineering courses down only to skeletons. We realize that it is very essential that engineers receive a fundamental training. On the other hand, it is necessary that we capitalize on the natural interests of our students as much as possible. Most of them enjoy working in machine shops."—Elmer Hutchisson, *Case Inst. of Tech.*

"Somehow, somewhere, a student should learn shop methods and shop techniques, otherwise he would not be a man well prepared to take his place in industry upon graduation. Knowledge of subject matter of engineering study does not constitute ability to practice Engineering. It is necessary that the student be schooled in the 'Art' of Engineering as well . . . Shop laboratory courses in some form are essential to justify the word engineering being used with the degree."—C. A. Joerger, *U. of Cincinnati.*

". . . our present curriculum represents a reasonable balance between a great deal of "shop work" as such, and the highly theoretical type of curriculum taught at some institutions."—C. L. Eckel, *U. of Colo.*

"Our shop work is not devised for the purpose of increasing manual skills, but is directed towards problems of production such as an engineer will undoubtedly encounter in industry. While this is the major purpose, we believe that good also arises from the combined use of head and hand in operating mechanical equipment . . . It has always been my personal opinion that those students who do not take the cooperative course should be given employment in industry during their summer vacation after sophomore year . . . Industry should be very active in endeavoring to promote this activity . . . If the colleges give men a sound basic and scientific education, then the industries should give them the specialized instruction even while they are undergraduate students. In general it seems to me that the cooperation between industry and the engineering schools has not been quite as intelligent as it should be . . ."—C. L. Emerson, *Ga. Inst. of Tech.*

"In this reduction process (of specialized courses) some shop courses have been curtailed in scope, but some other specialized theoretical courses have also been eliminated . . . I personally feel that a certain amount of shop work is desirable, although I must admit that we have probably reduced hours to the minimum . . . In addition to our regular programs, we have a rather extensive cooperative program, where much more shop work is given . . ."—J. T. Retalliata, *Ill. Inst. of Tech.*

"We hope our M. E. Graduates will never be called 'book learning' engineers, and we impress upon them the fact that they will have to compete with intelligent, practical, hard-working men who have come up from the ranks, and that if they expect to hold responsible positions they will have to put forth effort."—N. A. Parker, *U. of Ill.*

"In the 1946 issue of 'The Engineering Profession in Transition,' put out by the Engineers Joint Council, it was noted that more than 30% of the professional engineers in this country were engaged in technical administration management; design,

Tufts College, Medford, Mass., has this new 60x100-ft. laboratory. It houses machine tools acquired through war surplus, plus heat-treating, welding, and gage-testing facilities

development and applied research attracted 15, 7 and 5% of the engineering profession. About 4% of the engineers were in non-technical administration management. The rest of the 29 occupational statutes had a very small percentage of engineers in each. I believe you will see from these data that well over half of the engineers in industry today are engaged in management, design, development, and applied research. We have to train our students with that in mind. The percentage of students who would get into shop practice is small. We all know that such practical courses would be of considerable benefit to the engineer, but it seems to the average man in the engineering profession today that such training could be better obtained in industry than in college. If a man has the expectation that he would get into shop work, he ought to realize this at the very beginning . . ."—*Name withheld by request.*

"Personally, I feel that you are overly pessimistic. It is quite possible that many schools have decreased the time for Manufacturing Processes during the war interim because of the pressure of the number of students and the lack of adequate shop facilities. I am of the opinion, however, that this trend will reverse itself . . . We are convinced that manufacturing laboratories are necessary."—Huber O. Croft, *State Univ. of Iowa.*

"It is impossible, of course, to meet all of the various needs of the students in four short years. Our best hope is to stimulate them and to provide them with the means of continuing the educational process throughout their careers . . . We have recently taken some steps in liberalizing the engineering curricula by introducing one course in each semester in the fields of humanities and social sciences. We have not relaxed our insistence upon a sound foundation of science and mathematics and emphasis in engineering courses is upon fundamental principles with some applications in the various fields. A considerable amount of practical training is still required."—H. A. Neville, *Lehigh.*

"We believe a study of the general methods of manufacturing coupled with some practice in adjusting and manipulating machine tools causing them properly to perform certain functions in shaping materials, is just as necessary as is some experience in the Physics, Chemistry and Engineering laboratories which give students practice in the procedures used in the fields of development and research. The laboratory experience that a student gets in college is the bridge he uses to span the gap between the theoretical and practical sides of his profession."—H. B. Hoshall, *U. of Md.*

"In many cases the engineering schools in their expanding programs since the war have made no provision for shop work. Frankly, I feel that that is a step in the wrong direction . . ."—George A. Marston, *U. of Mass.*

"Old 'shop practice' courses were often given by subfaculty instructors who had been out of contact with industry many years and who tried to teach undergraduates something of what they remembered of industrial practice. A relatively small percentage of engineering graduates today find later important use for such knowledge . . . Subjects introduced instead won out on a straight competitive basis, not because shop laboratory work was unimportant, but usually because it was poor. It is essential that the subject matter be taught with an emphasis on the *why*, as well as the how, and that the laboratory work be done in a creative atmosphere, with worthwhile investigations paralleling the instruction . . . Our success in transforming . . . is due in part to new equipment, but much more to the fact that we have been able to interest top-flight metallurgists and professional mechanical engineers to cooperate in taking responsibility . . ."—Thomas K. Sherwood, *M.I.T.*

"Obsolescence of machinery and building certainly has played a part in relegating the 'shop' course to the 'has-been' ranks . . . Actually, obsolescence of mind and course content may have played as large a part in this 'final curtain.' Courses designed for the needs of 40 years ago may be even more obsolete than the tools with which they are taught . . ."—Lorin G. Miller, *Mich. State College.*

". . . In any case, the ability to appraise objectively and select wisely must be based on a wide knowledge of (1) various production methods; (2) mechanical and physical properties of available engineering materials; and (3) various means by which the properties of materials may be modified. In a well-coordinated laboratory lecture course, these ends are in a large measure attained."—T. P. Hughes, *U. of Minn.*

"By eliminating shop laboratory courses, colleges have eliminated a

very important phase of an engineer's education, in some cases more important than the courses added in place of the shop laboratory . . . When the most antiquated tools and equipment are used, the student still will learn the fundamentals . . . to appreciate the problems that confront the 'man in the shop' . . . We cannot substitute 'book learning' for 'learning by doing'."—Robert R. Stenger, *U. of Minn.*

". . . the student must have actual contact with machinery to appraise adequately the work of those who preceded him . . ."—Bert A. Crowder, *U. of Minn.*

"I believe there are and have been schools giving shop courses that were never equipped either with equipment or staff to do a real job. Those schools undoubtedly would be better off to quit trying to give shop courses . . ."—E. W. Schilling, *Mont. State College.*

"It is very hard for a man to design even a simple machine element if he has no concept of the manufacturing processes. Again it will be difficult for the designer to go into the shop and talk to the production men about their mutual problems if he doesn't have a basic knowledge of shop methods. I do not believe it is necessary that the equipment of the school shop be the equivalent of that found in industry. The cost would be too great for any but the wealthiest universities." — C. T. Grace, *U. of N. M.*

"I am not convinced at all that later courses on manufacturing processes take the place of the old shop courses, where students actually learn to handle machine tools and develop a certain amount of skill. Certainly in the senior year I could notice a greater ability to perform the little mechanical tasks which go along with setting up an experiment in the laboratory where some tools were required to be used, than I see now among the students who are required to take no shop courses of the older type."—Stanley G. Palmer, *Univ. of Nevada.*

"There is a fair proportion of less mathematically gifted students who would benefit by the inclusion of more courses having to do with techniques such as shop and surveying and at the expense of some of the more highly mathematical courses now in the curriculum. In a program such as administrative engineering where the highly technical has been replaced quite largely by management and similar courses, it probably would have been better to leave out a few of these and have more shop work."—William R. Bryans, *N. Y. U.*

"With the growth and strengthening of the technical institutes, it seems to me that these graduates should be relied upon to fill many highly specialized jobs formerly filled by engineering college graduates. Many students of a more practical turn of mind who formerly went to the engineering colleges should be encouraged to shift to the technical institutes to fill in a definite gap now not being adequately filled by the graduates from the average full-time college who have had little opportunity to learn the practical phases of metalworking."—W. T. Alexander, *Northeastern U.*

"May I mention that there is a distinct opportunity for majors in shop work who are not necessarily engineering graduates but closely allied thereto. We believe our curricula patterns in the various options of our 'Industrial Administration' course fills a distinct gap in the educational system which occurs between vocational training and professional engineering."—G. W. Gleeson, *Ore. State College.*

"In general throughout the country I think a chief defect of shop courses is failure to bring out the relationship of shop work to properties of materials as the latter are taught in other courses."—H. P. Hammond, *Penn. State College.*

"I grant the desirability of a reasonable amount of instruction in machine shop practice, but do not agree that it is as essential as you would represent it to be. I personally have worked for a company whose 'executives' seemed to make it their main objective in life, insofar as I was concerned, to make me don overalls and 'learn by doing.' That, however, was not the direction in which I could make my best contribution."—John A. Goff, *U. of Penn. (Towne Scientific School).*

Integrated Courses

"To make effective use of shop courses, they must be integrated with other courses in machine design, metallurgy, and industrial or 'administrative engineering.' Machine shops, foundries, pattern shops, gage laboratories, and metallurgy laboratories can contribute much to the essential general training of the engineering student, provided the faculty is composed of vigorous, production-minded, experienced engineers who can bring together shop and design instruction and plan shop experiments to demonstrate the capacities, limitations, and economics of the various machines and processes. Such a program means a large investment in space, machinery, curriculum time, and high-grade faculty. Such an investment will pay off in engineering graduates who know why and HOW.

"The machine-tool industry could help the colleges considerably by a reconsideration of the matter of educational discounts. By and large, the surplus war material program was much less help in this respect than is commonly imagined."—Otis Benedict, Jr., *Pratt Institute, Bklyn.*

"It is felt that an engineer's education is not complete unless he has had some contact with machine tools and production methods. The sales engineer is better qualified if he knows what may be expected of his products and why. The tool designer would have a difficult time designing a die if he has no appreciation of the actual steps necessary to build it or the time and cost involved. Many costly mistakes on the part of machine and tool designers could be traced to lack of any practical knowledge of basic shop work."—R. D. Anderson, *S. D. State College of Ag. & Mech. Arts.*

"It is especially inconceivable to us how any institution can produce good designers and industrial engineers without placing heavy emphasis on the basic manual processes. Demonstrations alone are not sufficient."—Bydik S. Jacobsen, *Stanford.*

"While we are not attempting to train machinists or shop men, nevertheless we believe that our students must be brought into close contact with factory equipment and methods if they are to be able to fill the job they accept upon graduation."—H. W. Barlow, *Ag. & Mech. College of Texas.*

"Shop courses in an M. E. curriculum is largely a matter of location of the school, or rather the field from which it draws its students. In localities where industries are numerous and students can spend their vacations in shops, there is probably little use for shops in the schools."—H. F. Godeke, *Texas Technological College.*

"Knowledge of present manufacturing processes gained through shop-laboratory instruction is of great value to young engineers. For example, designers and production engineers alike are continually faced with decisions as to how a part should be made. Possibilities and limitations of the various processes and machine tools should be understood if these decisions are to be made properly. Low factory costs cannot be obtained without this."—M. L. Begeman, *U. of Texas.*

"My observation has been that there is a tendency to give too much theory and not enough practice to our present engineering graduates. The cause is largely due to the fact that the increased enrollment in engineering colleges has made necessary the employment of instructors rather lacking in practical experience."—A. LeRoy Taylor, *U. of Utah.*

"The Engineering College can and does give real basic shop knowledge and skill much faster than is usually done in industry . . . The cooperation plan from experience is not the best way as far as shop training is concerned. Too often a trainee is stuck with a repetitive job because he does a good job at it."—W. A. Sargent, *Wayne U.*

"The need of new courses through which to present newly developed knowledge in the several engineering fields as well as the need for paying more attention to the so-called social-humanistic stem of knowledge, have forced us, during the past few years, to a critical re-examination of our curriculum . . . This study has resulted in a reduction in the time devoted to shop courses, but we still believe that such courses have a real place."—R. P. Davis, *West Va. U.*

Equipment

MANY colleges obtained equipment from war surplus (see tabulation, page 176) but this was not without its difficulties. As F. H. Thomas, U. of Buffalo says: "For the most part, only equipment that is highly specialized has been available, and as a result, schools will find themselves not much better off than with the junk they used to have—and probably still have."

Says C. T. Grace of U. of N. M.: "Basic machines that the schools needed were also wanted by industry and were picked up before the schools were equipped. The result was that the 'white elephants,' special-purpose machines, were often all the schools had to choose from. As an example, our machine shop is in dire need of a universal horizontal milling machine . . . Instead we ended up with a very large turret lathe suitable for high production of a few large parts only. Purchase of stock and tools for this machine for shop purposes would eat up the shop budget in a short time."

Purchase of new equipment requires a large cash outlay—which if made raises the "cost per student hour of instruction so very much higher than in any other phase of instructional work that the powers that be do not deem it justifiable."

Even with surplus or donated equipment, costs of installation are terrific. In at least one case, the tools stand idle for want of an appropriation to buy transformers; in several, major outlays have been required to modernize old buildings or build new ones. Several deans feel that more equipment suppliers should grant substantial educational discounts to ease modernization.

A Five-Year Course?

General opinion seems to be against a 5-year program for a bachelor's degree (except for the cooperative courses, which are frequently five years) Here are opinions:

"We are not convinced that this is the way to handle the matter, and also the fact that less than 5% of all the engineering students in the country are pursuing a 5-year program would indicate that it is not generally accepted as the solution . . ."—J. T. Rettaliata, *Ill. Inst. of Tech.*

". . . only a handful of colleges in this country have adopted a 5-year engineering program. Almost all the others have stayed at four years, and most of them will for quite some time . . ."—*Name withheld by request.*

"I do not feel that the 5-year program for the undergraduate engineering degree is the proper solution."—G. A. Marston, *U. of Mass.*

"All of these (see pages 162-170) are four-year curricula which require one summer in residence in addition to eight semesters . . . However, it is not likely that we will be able to give our students a satisfactory minimum amount of this training as long as we award engineering degrees in four years. Most of our faculty would prefer to extend the college training of professional engineers to five years, or perhaps six. Some of us would prefer that a student take two years in the College of Liberal Arts, then come to a purely professional school of engineering for the remainder of his education. We are not in a position to pioneer in lengthening our curricula to five years, although we have been able to pioneer in other ways."—*Name withheld by request.*

"I am one who believes that at this time it is preferable to give a 4-year curriculum and to encourage those who are equipped for it to take graduate training rather than to require five years of everyone."—E. W. Schilling, *Montana State College.*

"There is a certain pressure to retain the 4-year curriculum in engineering and at the same time to include courses in social sciences and humanities such pressure inevitably results in crowding out of some courses, and many people discard the shop course with a casual statement that this part of the work can be learned after graduation."—T. Stephen Crawford, *R. I. State.*

"While it is true that the new 5-year, full-time program has some extremely attractive features . . . as tuitions have continued to rise, I am not sure that a 5-year full-time program is a satisfactory answer for many students."—W. T. Alexander, *Northeastern U.*

Afterword

Frequently, the failure to provide shop courses is defended with, "After all, our graduates will direct the men who run machines—they won't run the machines themselves." Which leads us to that Biblical quotation about the blind leading the blind. Or to put it in other terms: Let's say you trained an orchestra conductor in the theory and history of music and similar "humanities," but didn't train him to play any instrument—that being a "purely manual" operation. He is an executive who directs manual workers in music. That contradicts all musical experience—just as no knowledge of shop work contradicts all mechanical experience.

A. N. Severson, U. of Minn., and W. A. Sargent, Wayne U., list these advantages for shop instruction:

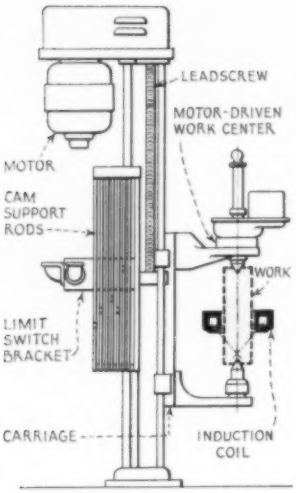
1. Familiarizes students with machines, tools, processes, and materials
2. Gives them confidence in ability to make equipment and to judge its practicality
3. Shows them difficulties in shop practice, the need for skill
4. Gives them a look at the worker's point of view
5. Provides a broader background
6. Gives familiarity with shop terms
7. Enables an engineer to instruct an operator on new equipment
8. Provide variety and relief from lectures and discussion

What are your views?

One corner of a shop laboratory at University of Okla. All tools are modern, floors are wood block, with fluorescent lighting and a monorail hoist

HOW TO HANDLE PARTS IN INDUCTION HEATING

BY CLARENCE E. GLICK
Production Engrg. Manager
and
ROGER E. HARLEPP
Design Engineer
TOCCO DIVISION, THE OHIO CRANKSHAFT COMPANY



Cylindrical Parts . . . Cylindrical parts to be heat-treated continually over a predetermined length, or in specified spots by consecutive positionings, can be handled in this preset-cycle vertical fixture. It is a vertically movable carriage supporting the loading-center brackets. Carriage leadscrew is driven by variable-speed dc. motor and gear train, and controlled by limit switches in electronic control circuit. Cams adjustable on vertical rods attached to carriage are set to provide required speed variation in either direction, successive stops if necessary, automatic return, etc. As some heating operations require rotation of the work, either of the loading centers can be driven by an independent motor

HIGH-FREQUENCY energy creates specialized problems in selecting materials for fixtures. Heat generated by induction and dissipated by conduction prohibits the use of conventional materials and complicates lubrication.

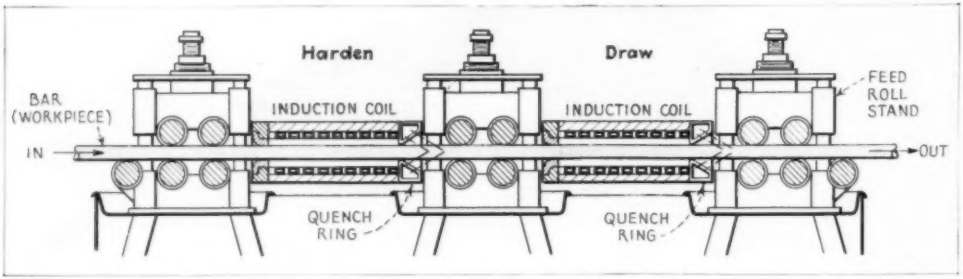
One difficulty in designing parts-handling equipment for induction-heating apparatus resides in the choice of materials. The presence of high-frequency energy creates a number of problems not met in usual fixture design.

For instance, parts processed through longitudinal coils slide on guides supported by the ceramic lining protecting the coils. These guides must resist both the high temperatures developed inside the coil and the abrasive effect of sliding metals. They are often Nichrome or Inconel tubing, cooled by circulating water, with a wearing strip on the sliding surface and allowance for longitudinal expansion.

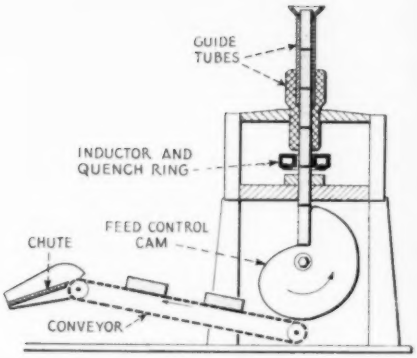
In other cases, parts closest to the inductor tend to expand and contract with the heating cycle, resulting in warpage, misalignment and undesirable stresses. When the radiant heat is not prejudicial, non-conductive materials such as Transite and plastics such as Micarta and Bakelite, are used, especially when problems of stray induced currents are encountered. If radiant heat is excessive, metallic parts must be used, and such parts should be non-magnetic. They are commonly brass and austenitic steels, such as stainless steels. Even then, one must be careful of breaking all possible closed electrical circuits.

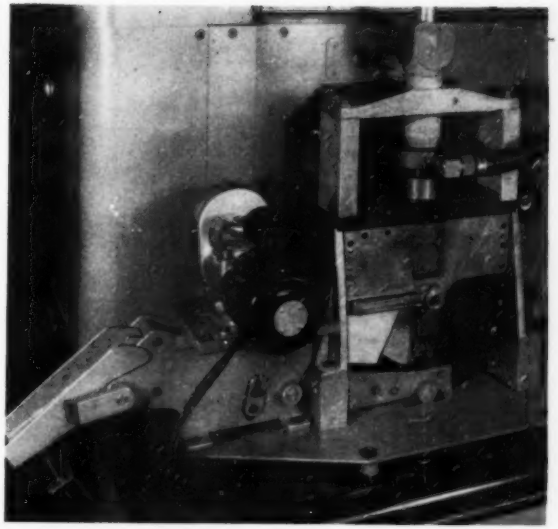
When necessary, parts are water-cooled, and proper materials avoid rust resulting from the water. In any case, the designer must keep in mind a balance between the structural strength required of the fixture and the necessity of keeping to a minimum the effect of the high temperatures encountered during the heating operation.

Smart handling spells efficiency in fixturizing production-line inductors . . . These typical fixtures designed for heat-treating, soldering, brazing, forging and shrink-fitting illustrate basic principles

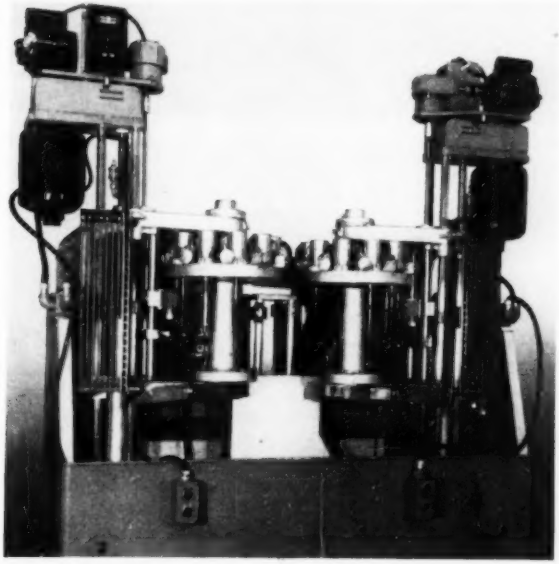


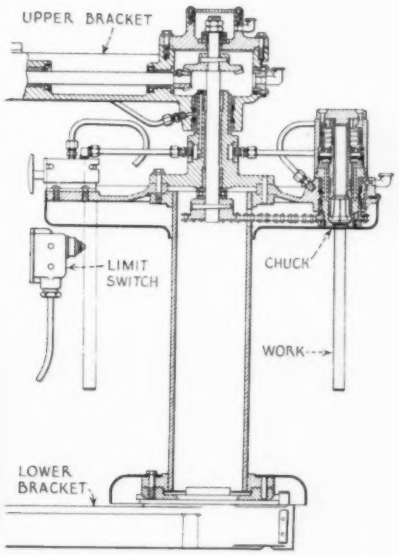
Bar-stock Hardener . . . Bar stock is continuously hardened and drawn in this unit. It consists principally of three stands of power-driven rolls separated by two induction coils, each of which has a water-spray quench ring. The two coil boxes each consists of a Transite box housing the helicoidal coil and a concentric ceramic lining. Bars of various lengths in diameters from ½ to 2 in. can be heat-treated





Piston-pin Hardener . . . Piston pins and similar parts are continuously hardened in this fixture. Parts are loaded into vertical guide at top and pass down progressively through inductor and quench rings onto feed-control cam which ejects parts onto discharge conveyor. Feed cam has special spiral periphery to suit part length, and speed to suit hardening cycle. Rotation of cam permits line of parts to feed down gradually. At position sketched, one feed cycle has been completed and cam is ready to transfer hardened pin to constantly moving belt conveyor for delivery to discharge chute. Rotating cam then will catch next pin in line on highest point on lobe

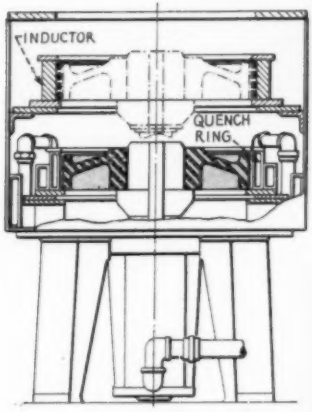




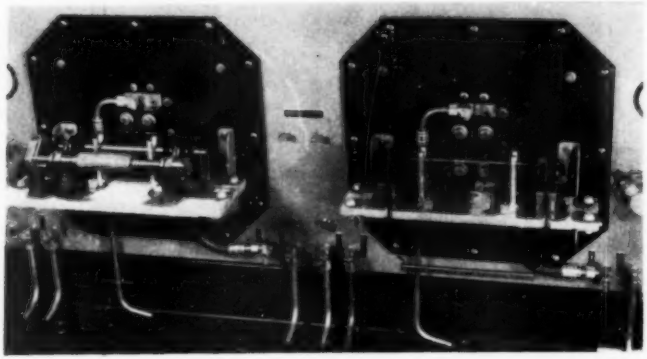
Shaft Hardening . . . Two vertical "Toccotrol" fixtures with automatically indexed heads harden specified areas on generator armature shafts. Workpieces are held in air-operated vertical collet chucks spaced around a circular carrier near the top of each head. Each head is supported by brackets of a standard fixture. Shaft in chuck automatically is indexed above inductor, lowered into it and slowed down to predetermined heating speed, until hardening is completed. Head then is quick-traversed to original position and next indexing brings hardened part over gravity discharge chute. Special indexing head has eight air-operated collet chucks. Each vertical chuck is rotated continuously by chain drive from vertical shaft at center. Limit switches interlock each automatic cycle of fixture. Parts are loaded manually—but discharged automatically at end of downstroke

How to Handle Parts In Induction Heating

continued

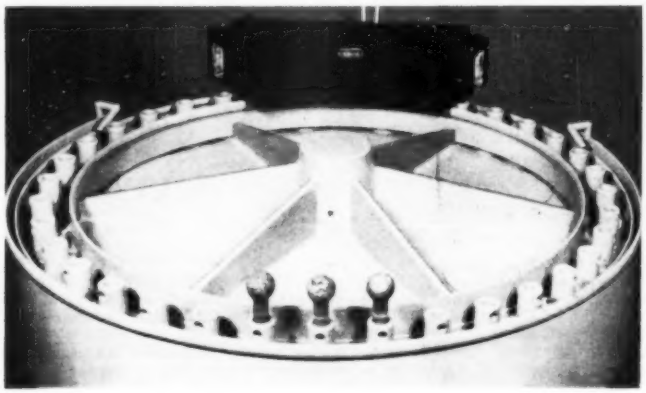


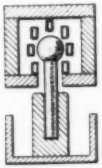
Gear Hardener . . . Designed for hardening teeth of gears and pinions, this special machine has interchangeable heating coils to suit gear diameter. Inductor is mounted inside circular shell of machine directly above concentric oil quench ring fed from concentrically mounted reservoir. In center is vertical hydraulic piston carrying interchangeable gear locators. Piston holds gear in top position for heating, then lowers into quench as part of automatic cycle. Motor-driven unit is mounted on swinging arm at top for rotating gear while it is heated



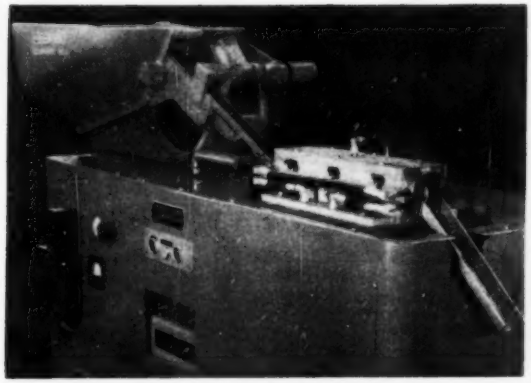
Brazing Levers . . . Brazing of hook-shaped levers on typewriter shift bars is done with this double-fixture setup. Workpieces come to machine assembled, and with solder rings in place. Unit fits over inductor of special design which surrounds parts to be brazed

Coil Brazing . . . Two concentric copper coils with common fittings at each end are brazed at all fitting joints with this duplex setup. Parts are manually loaded on fixture table. The two fixtures are operated on alternating cycles, one fixture being loaded while assembly in second fixture is heated for brazing. As two ends of coils are not symmetrical, one fixture is tooled for one end, and the second for the other end of coil assembly, and one finished coil is removed from machine at end of cycle

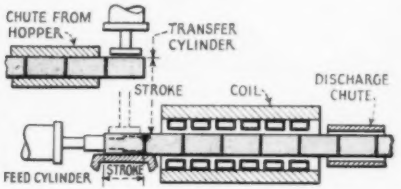




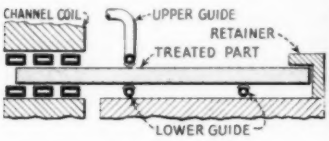
Knuckle Treater . . . Steering knuckles are loaded manually into individual holders spaced around carrier of above fixture. Peripheral section of fixture is circular water-filled channel in which workholders move. Carrier rotates at speed matching heating time of arcuate channel-type coil (sketch) at fixture rear. Tail of the knuckle, immersed in water, is metallurgically unaffected by heat-treatment of ball section

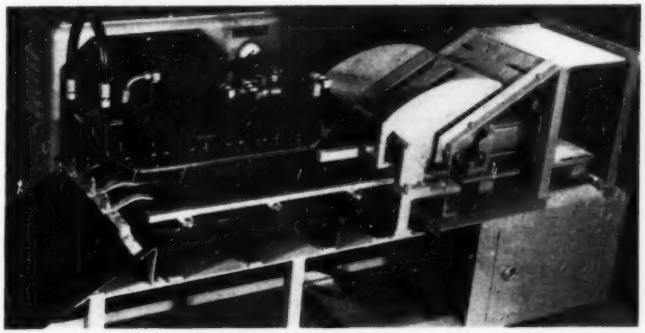


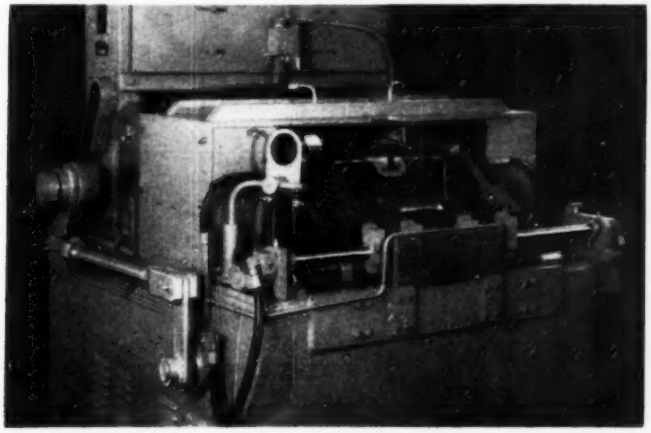
Slug Heater . . . Steel forging slugs are loaded into hopper with rocking agitator at left. Agitator feeds slugs end to end down chute. At chute bottom, slugs individually are moved laterally by hydraulic cylinder until they face open end of horizontal heating coil. A second cylinder then pushes slugs end to end through coil and down chute to forging press. The two cylinders operate in an interlocked automatic cycle timed to deliver properly heated slugs to forging press at required rate



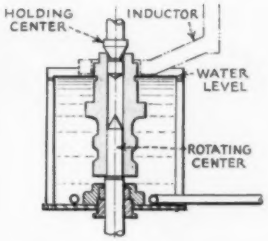
Bar Heater . . . Hopper-fed bars are moved across fixture sidewise, with one end of each bar in line entered into channel coil for heating before forging. Feed and heating speed are preset to suit forging rate. Longitudinal guides support bars; guide wear surfaces are hard faced to resist abrasion of moving bars as they are pushed across fixture by hydraulic cylinder



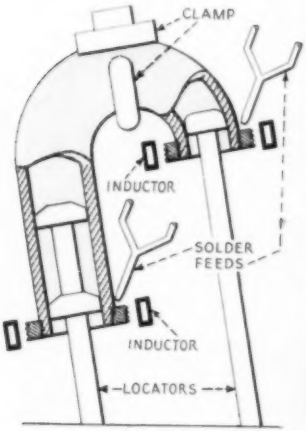


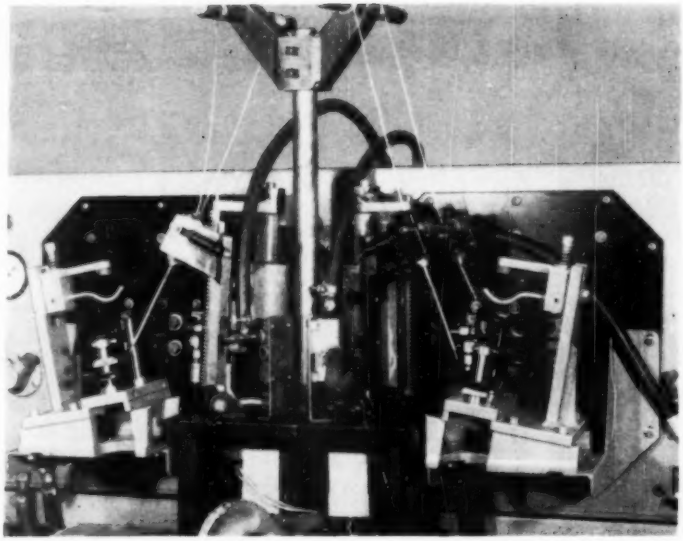


Two-End Bar Heater . . . Continuous-heating both ends of steel bars simultaneously, this setup is mechanically operated by the forging press, and is automatic. Bars are loaded into hopper, travel transversely on guide rails and pass through two channel heating coils, adjustable to suit lengths. At bottom of discharge chute, heated bar is picked up by press tongs. Ray-O-Tube temperature-control unit controls heating rate so bars are within correct forging range. About 600 bars of 1-in. dia. are heated per hour

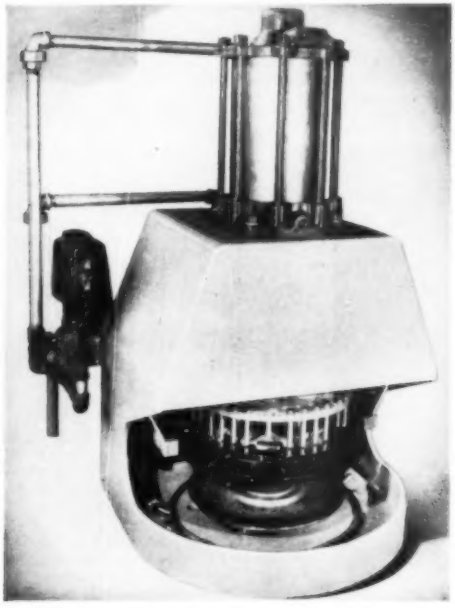


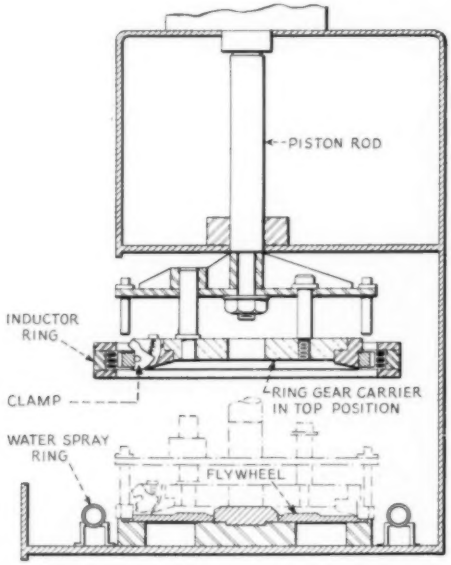
Spot Hardener . . . Vertical fixture with cam control can be adapted for hardening a cylindrical section when the heating cycle must not affect an adjoining surface. Here, lower bracket of standard fixture supports a water-filled tank in which is the lower locating center. Part is loaded below inductor coil, then carriage raises lower bracket to heating position. At this point, part also is centered by upper spring-loaded center and section of part to be hardened is just above water level. After heating cycle, part is quenched in the inductor and fixture returns automatically to its original position for unloading





Soldering Fittings . . . Duplex setup for soldering a fitting at each end of goose-neck drain trap has unusual solder feeders aimed at surfaces to be joined. Fixtures operate alternately, one being loaded while assembly in second fixture is being soldered in automatic cycle. Double-loop induction coils are used at each soldering position. Sketch shows how traps are supported and clamped. Wire solder is led to feed units from coils supported above machine





Shrink-fitting Gear . . . This hydraulic fixture was developed for shrink-fitting a gear ring on a flywheel periphery. Gear is fitted on carrier, where it is held with spring-loaded clamp fingers. After heating with inductor coil, hydraulic cylinder lowers gear onto flywheel held in lower locator. Here, in automatic cycle, clamp fingers are released, ring gear is dropped onto flywheel and cooling-water spray is turned on. While ring gear is cooled, pins in carrier hold gear down against flywheel to insure accurate location during the cooling period

CONDUCTORS STRESS-RELIEVE WELDS

BY C. C. ROBERTS, Application Engineer,
BROWN INSTRUMENT COMPANY

WELDED JOINTS in high-pressure piping from 1½ to 24 in. dia. must be stress relieved to meet requirements of the ASME code. Availability of electric heating cables in different sizes makes convenient the stress-relieving of any type of joint, such as pipe to pipe, pipe to fitting and pipe to valve.

Correct temperature and accurate timing are essential to satisfactory stress relieving of welded joints. In shop fabrication, a time-temperature chart of the preheating and stress-relieving operations may be required. Temperatures at and adjacent to the weld are measured and recorded by a circular-chart recording potentiometer of the electronic type, using thermocouples attached to the work. Thus, a case history of each weld is made available to operators, inspectors and supervisors.

Sometimes in production work it is impractical to attach thermocouples to the piping assembly. In such cases, automatic recorders are used during a pilot welding operation to establish a program for preheating and stress-relieving currents versus time. A fully automatic program control can be obtained by incorporating automatic time switching with the automatic temperature control.

The heater units are wrapped around the weld area and then covered with an asbestos blanket. Heating units consist of resistance wires incased in refractory insulation and placed in position over the weld area. These coils are connected to the control panel, and the current through them is adjusted to produce the preheating temperature.

After the weld has been made, a third coil is wrapped directly over the weld and connected to the control panel. The current through all three coils is now adjusted to create a uniform temperature sufficient for stress relieving the entire weld area plus a distance on each side of the seam equal to at least six times the pipe-wall thickness. And during the heating operation, radiation is minimized by wrapping an asbestos blanket over the heating units.

Adjustments on the control panel make it possible to preset the complete process of preheating, stress relieving and cooling (on the fully automatic program control units). Automatic control of temperature is effected by the on-off action of mercury switches in the electronic controller.

To offset inequalities in heat requirements where there is more metal on one side of the joint than on the other side, as when welding a valve to pipe, an auxiliary contactor is provided to handle the increased heating current locally needed. An input regulator permits extending the full-capacity heating for any interval.

Electric heating cables wrapped around welded pipe joints will preheat, stress-relieve and retard the cooling rate, if the equipment contains suitable temperature, time, current and switching controls. Unit shown is connected to thermocouples at work and provides a time-temperature chart

How to Avoid Rejects On Large Interchangeable Parts

Working dimensions, measuring techniques, and clamping methods deserve careful consideration if close tolerances on massive parts are to be held

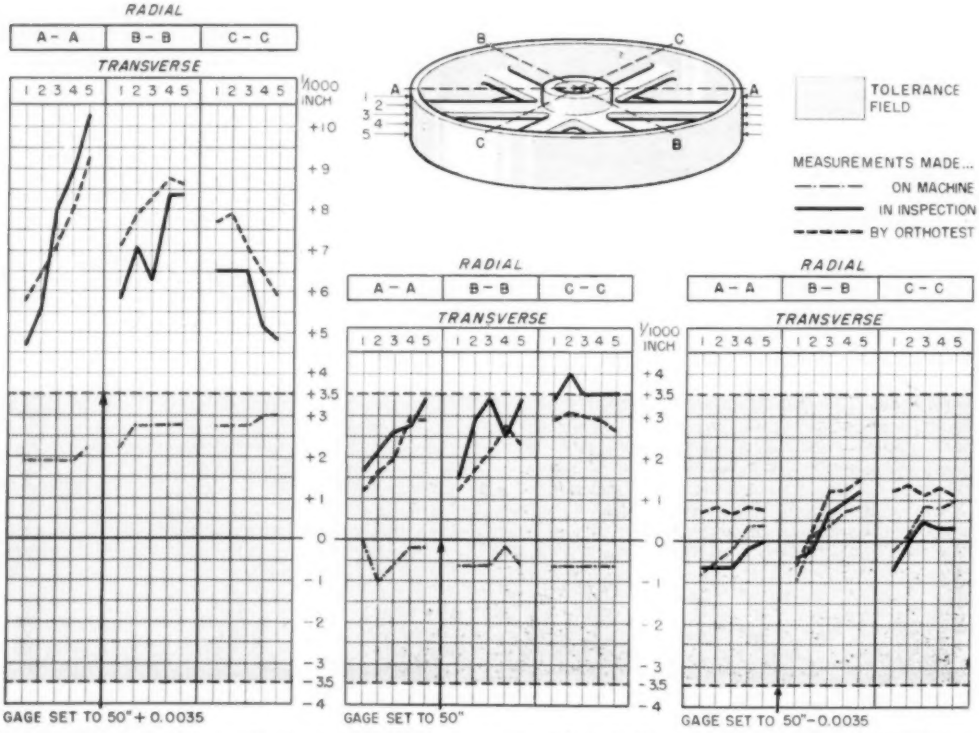
BY PROF. N. N. SAWIN, DR. ING.

LARGE interchangeable parts present more production difficulties than do small ones. Pieces that are measured while clamped in the machine may not be satisfactory when checked in the inspection room. Inevitably, both shape and dimension change after the piece is removed from the machine and temperature equalization takes place.*

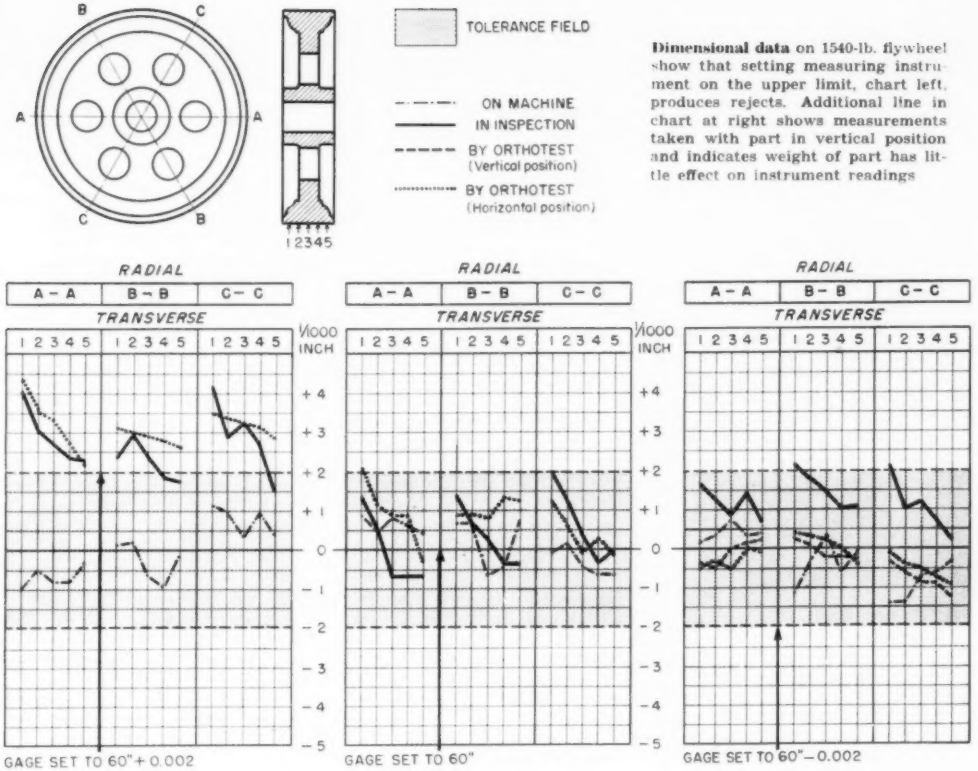
Affecting these changes are the stresses set up during machining—stresses from clamping, cutting tools, and temperatures. Also involved is the shape and massiveness of the workpiece. To obtain information as to what can be done to avoid rejects from these causes, numerous tests have been made by the author on parts ranging from 1 to 12 ft. in diameter.

Data obtained from these tests form the basis for the following recommendations regarding the

*N. N. Sawin, *American Machinist*, Jan. 2, 1947, p. 89.



Measurement charts show results of measuring 50-in. outside diameter of cast-iron pulley in three radial directions on five transverse sections. Charts contain data obtained with working gages set successively to three different dimensions: to the upper limit of the tolerance field, left chart; to the naught line (nominal dimension), center chart; to the lower limit of the tolerance field, right chart. Last setting produces best results



Dimensional data on 1540-lb. flywheel show that setting measuring instrument on the upper limit, chart left, produces rejects. Additional line in chart at right shows measurements taken with part in vertical position and indicates weight of part has little effect on instrument readings

method of machining large parts:

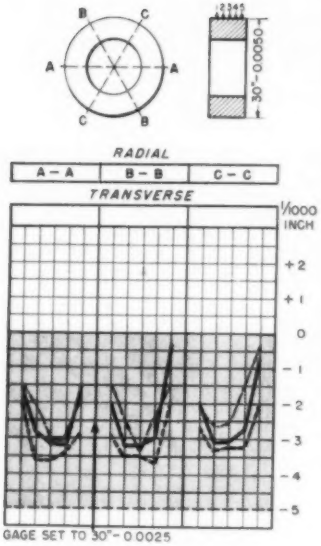
1. Finishing cuts should be taken with only slight tightening of the clamping bolts.
2. Machining near the upper limit of the tolerance field is dangerous. After the work is released from the clamping bolts, its dimensions usually increase.
3. Machining to the dimension in the middle of the tolerance field reduces the danger of rejection of work in inspection. If tolerances are symmetrically disposed, this machining dimension corresponds to the nominal dimension of the work.
4. Measurements by the workmen on the machine and the inspector in the inspection room must be carried out with the same instruments. Settings of the adjusting gage must be made under identical conditions.
5. During final measurement of the work on the machine, the difference between the temperature of the work and that of the measuring instrument should not exceed 6 F. This is also true for the temperature of the work relative to that of the inspection room.
6. Tolerances of easily sprung objects must be greater than those of heavy, massive parts.
7. Tolerances for holes may be smaller than tolerances for corresponding outside surfaces. Measurement errors for holes are usually less than those for outside dimensions.

The above recommendations are justified by results obtained during test runs. These were made on vertical boring mills under normal manufacturing conditions. Products studied are listed in the accompanying tabulation and are typical both as to shape and properties of parts frequently encountered in the manufacture of large interchangeable parts.

In such production, common practice is to set adjustable gages to the desired dimension and to work to this setting. For the test cuts, a gage of this type, the Sawin

TYPICAL PRODUCTS STUDIED

PART	MATERIAL	DIAMETER (in)	WEIGHT (lb)	TOLERANCE (1/1000 in)
belt pulley	cast iron	50	297	±3.5
flywheel	cast iron	60	1,540	±2.0
ring	cast steel	30	316	+0.0 / –5.0
ring	cast steel	109.5	10,440	±4.0
wheel	cast iron	109.6	14,830	+4.0 / 0.0



Cast-steel ring data show that results are good when gage is set midway in the tolerance field

instrument,* was used throughout.

The chief purpose of the research was to find the proper dimension to which instruments can be set for measurements during machining, such that contours and dimensions of the piece are not outside the tolerance field at the time of inspection. Therefore, for the first two parts shown, the outside surfaces were machined with the measuring instrument set to successively different dimensions within the tolerance field.

For each setting, the workpiece was carefully measured: first by the workman after the finish cut while the piece was still clamped on the machine; second by an inspector in a room held at approximately 68 F. The second measurement was made after the work had remained in the room a sufficient length of time to insure equalization of temperature, if necessary for several days. All measurements were in each of five transverse sections, 1-1, 2-2, 3-3, 4-4, 5-5, sketch, and in three radial directions, A-A, B-B, and C-C. Errors in measurement with the Sawin instrument were within ±0.001 in.

The results of these measurements are plotted on the charts accompanying the parts. The tests showed with absolute evidence that setting the measuring instrument to the upper limit of the tolerance field produced rejects, setting to the naught line gave satisfactory results, but setting closer to the low limit was much better and more reliable.

It was found that clamping the pulleys on the machine with bolts inside the rim gave no better results than the usual method of clamping with bolts and cover plates on the arms.

Reliable measuring techniques are essential. For measurements both at the machine and in the inspection room, the same special Sawin instrument was used. In every case, the instrument was adjusted in the same positions with regard to the measured work and with the same minimum pressure on the contact surface. Both workmen and inspector supported the instrument at the same prescribed points.

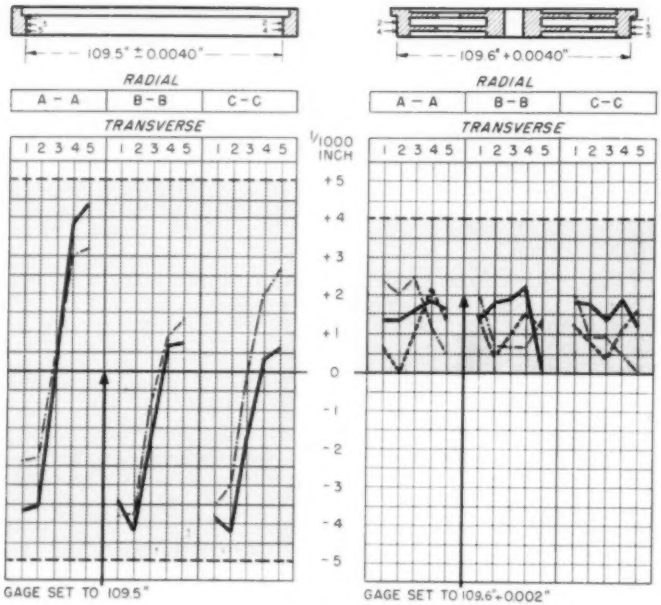
All dimensions were corrected to 68 F. In measuring temperature of the outside surfaces of the work the Zeiss body thermometer with a flat silver container for mercury was used; the accuracy of this thermometer is ±0.2 C.

To obtain greater accuracy, the pieces were measured a third time in a special room with temperature regulated to 68 F. ±0.5°. Measurements were made with a K. Zeiss Jena "Orthotest" and slip gages. With this method errors did not exceed ±0.0005 in.

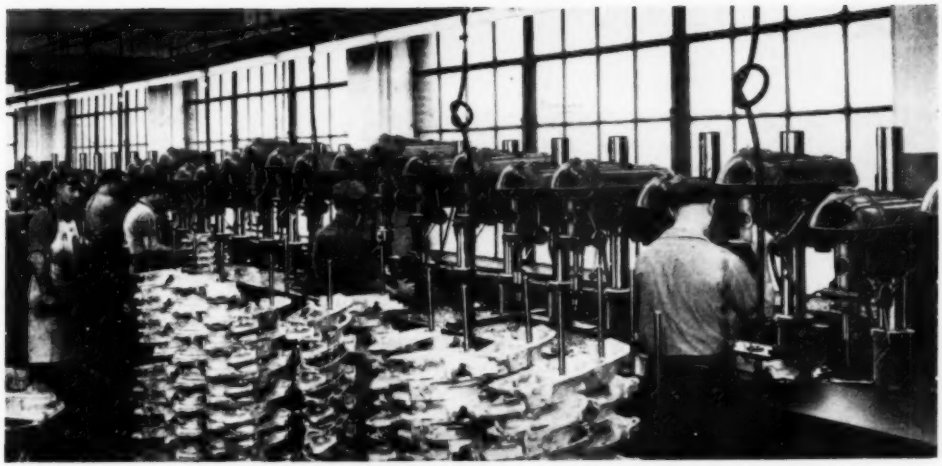
Using the same method, the flywheel was also measured in the vertical position to determine the influence of elastic deformation caused by the weight of the work. Differences between horizontal and vertical readings were insignificant.

In the case of the steel ring with no plus tolerance and −0.005 in., results were satisfactory when manufacturing was carried on with the measuring instrument set to a dimension in the middle of the field.

The same is true of the wheel to which the ring is shrunk.



Huge mating parts were machined to tight tolerances for a shrink fit. Both 10,440-lb. ring, left, and wheel, right, 14,830 lb., were successfully produced by working to a gage setting at the center of the tolerance field



Motorcycle parts require high precision on a large number of relatively small drilling, reaming, tapping, and spotfacing operations. This battery of Walker-Turner drillpresses is in the Harley-Davidson plant

Light Drillpresses
ARE VERSATILE TOOLS

BY H. E. LINSLEY, ASSOCIATE EDITOR

FEW machine tools are capable of performing so wide a variety of operations, or of being applied in so many completely unconventional ways, as are modern light drillpresses. Designed originally for straightforward drilling, reaming, and tapping operations, they have been literally turned inside out and upside down by ingenious tool designers in their search for quick, easy and inexpensive ways of performing any operation which involves a rotating and reciprocating spindle.

The variety of fixtures, stops, cams, counters, gages, speed reducers and increasers, feeders and ejectors, and other assorted hardware that has been attached to almost every available inch of drillpress structure baffles description. They have been mounted on wheels, on skids, and on special bases, single and in batteries, and attached to the floor, the wall, and even the ceiling. They've even been decapitated—and several heads used, with or without columns and bases. But the net result of all these seemingly fantastic performances has invariably been a reduction in manufacturing costs with a minimum capital outlay, and an accurate job performed more quickly and more easily.

Following pages illustrate a few outstanding examples of ingenious setups that have been successfully operated in Metalworking and other industries, and that have repaid their cost many times over by reducing production time or substituting for expensive special-purpose machines.

A SPECIAL American Machinist REPORT TO THE METALWORKING INDUSTRIES

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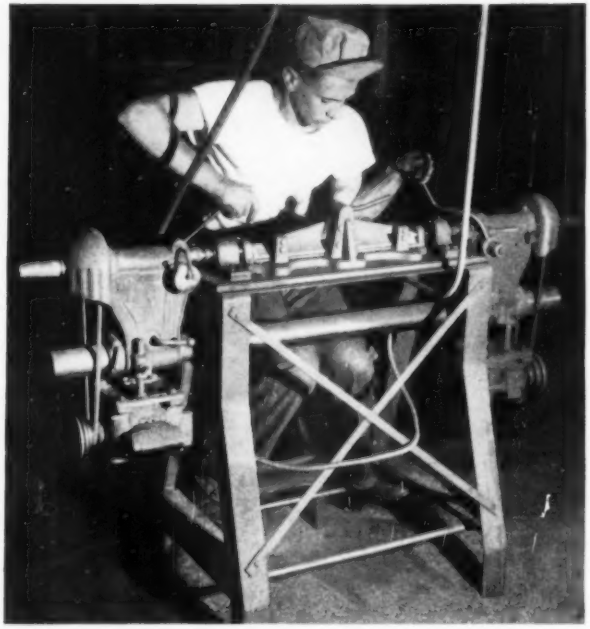
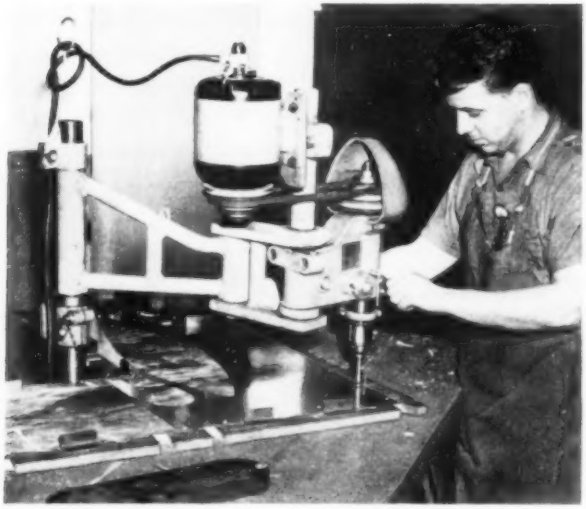
THE LIGHT DRILLPRESS WELCOMES



Countersinking both ends of power lawnmower cutter bars simultaneously is readily carried out with a simple steel bench carrying a column for mounting two Atlas drillheads horizontally



Radial arm constructed from welded plate and tubing carries a Delta head to extend the reach of the machine to remote areas of large flat plates. Arm is mounted on standard floor-type column

CURRENT DEMANDS for increased productivity have resulted in the development of a tremendous variety of completely special machines, among which special drilling machines are perhaps the most common. These are undoubtedly of great value in mass-production plants where their high cost can be absorbed by the huge number of parts being processed. For the smaller shop, however, and for jobs in the large shop that are not in high production, such equipment is usually too expensive to buy and operate.

To meet the problem of multiple-hole drilling of small holes at minimum cost, many manufacturers have turned to special arrangements of standard bench-type drillpresses. By means of special brackets or bases, drillheads are mounted singly or in groups, at simple or compound angles, and with a wide variety of mechanical, electrical, hydraulic or pneumatic controls.

In cases where work comes through in large batches at widely spaced intervals, but fast production and minimum costs must be maintained for each batch, the low cost of these special setups makes it feasible to allow them to stand idle during the waiting periods, a condition that could not be tolerated with the heavy investment involved in most special machines.

Initial expense is relatively low, and if the job should be discontinued, the drillheads can be removed from the base and reused on other setups. Although the units are originally designed to operate in a vertical position, their construction is such that it makes no difference to their operating efficiency whether they are mounted horizontally or upside down.

For emergency work, and in cases where a considerable number of holes must be drilled in the field, drill units can be equipped with suitable bases to adapt them to the workpiece, and will usually be found more efficient than portable electric drills.

In some cases, as when drilling tall objects, the base of the machine column may be attached to the ceiling or slidably mounted on an over I-beam. The drillhead is then used in the normal position by mounting it with the top end toward the "base."

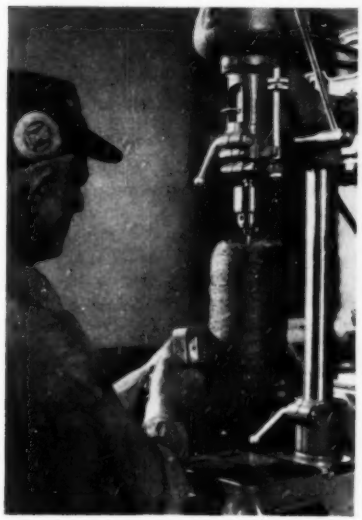
UNORTHODOX APPLICATIONS

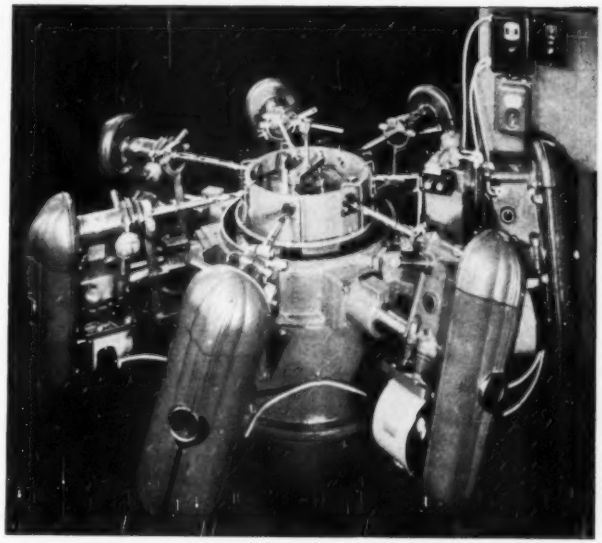
When long reaches are required, the head may be removed from the column and mounted on a built-up radial arm of suitable length attached to the original column, to a suitable wall bracket, or to a special floor mount.

For long rows of holes, as in the sides of metal ladders, as many as 20 or more standard drillpresses may be mounted side by side and operated simultaneously through a master switch and a continuous shaft geared to the lever pinions. Uniform spacing and perfect alignment is thus guaranteed, and all holes are drilled in the time ordinarily required to drill one.

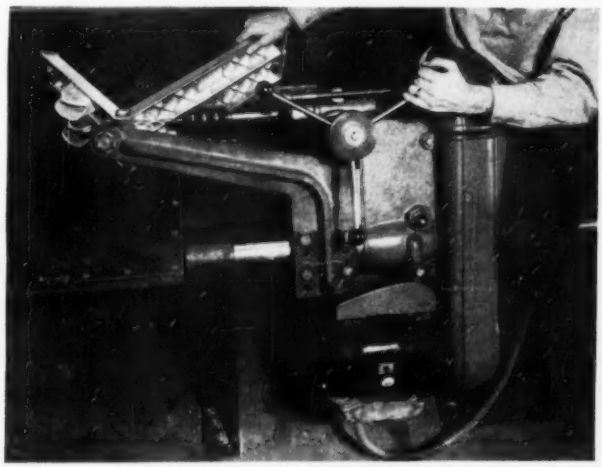
Considerable work handling can often be avoided by incorporating a drillhead as part of another machine. In balancing crankshafts, for example, one or more drillheads can be mounted directly over the balancing points so correction for unbalance can be made without removing the workpiece from the machine. Similarly, drill units can be mounted on a broaching machine to permit holes to be drilled in one surface of a part while another surface is being broached.

Where small holes must be drilled in large workpieces held in massive fixtures, physical limitations of standard sensitive drillpresses make it necessary to employ large radial drills, a proce-



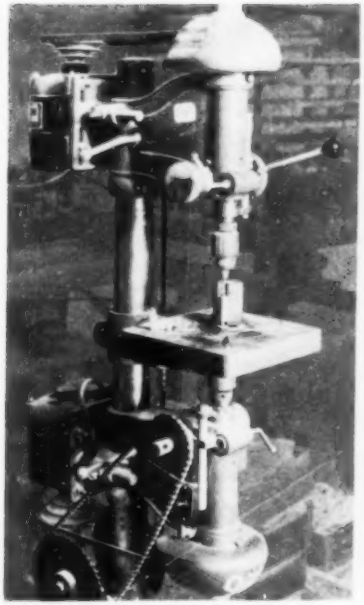


Seven-spindle machine for drilling, reaming and tapping valve tappet holes in an aircraft engine crankcase is built up from seven standard Delta drillheads and an air-operated base fixture

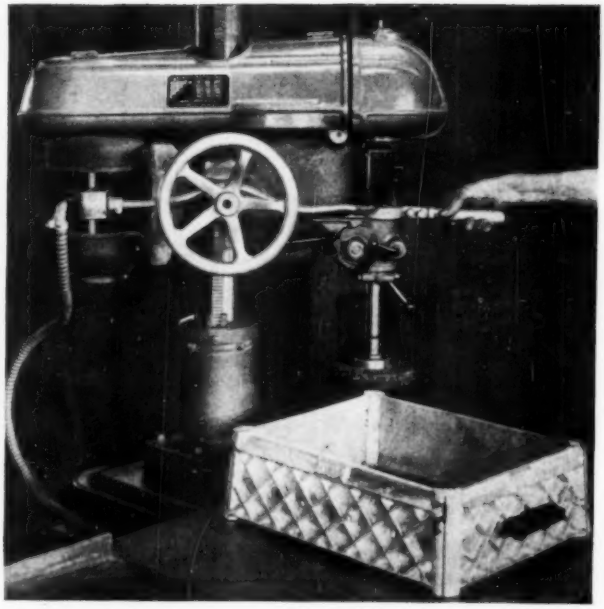


Corner drilling of aluminum molding flasks is performed by mounting a Walker-Turner 20-in. drillhead on a horizontal mount with a special locating fixture made a part of the assembly. Awkward holding job is thus simplified

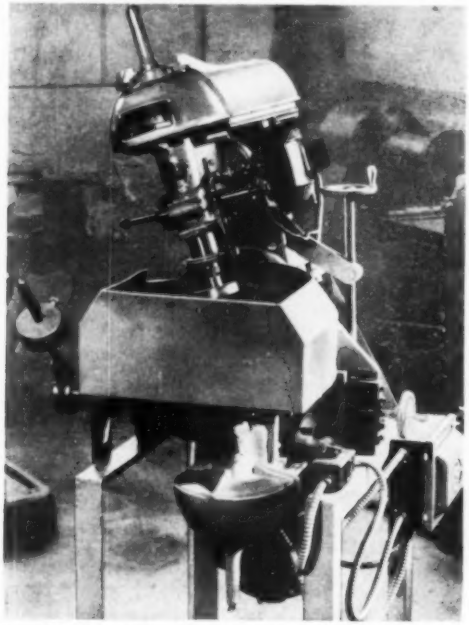
← **Cleaning** and deburring plastic parts, and descaling and polishing operations on castings are performed with a pad of steel wool wound on a mandrel held in the chuck of a standard Delta drillpress. These pads are commercially available



Chain and sprocket arrangement synchronizes spindle movement of two Atlas drillheads mounted on a single column for drilling a radio post insulator



Surface grinding aluminum molding flasks is performed successfully by mounting on abrasive wheel on a special adapter on a Walker-Turner drillpress. Head is swung through an arc by means of a suitable handle attached to the spindle housing



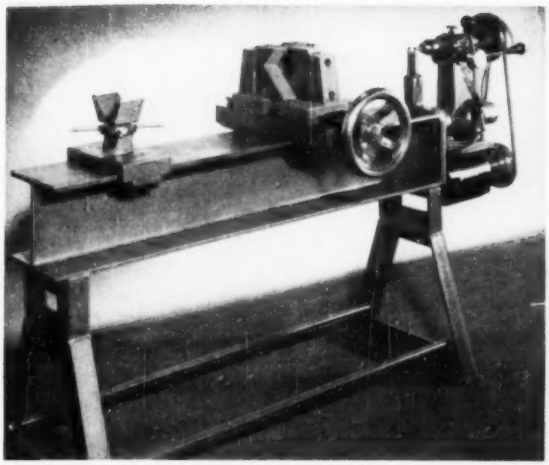
Lens blanks are rough ground to specified curvatures by a combination of two Walker-Turner radial drillheads. The upper unit is mounted on an adjustable tilting bracket, while the lower one rotates the work

dure which adds considerably to the cost of the operation. This condition can be overcome by incorporating a standard bench drill unit as part of the fixture, thus freeing the radial for heavier work, for which it is more suited, and permitting the use of a less highly skilled operator.

When a series of minor drilling, reaming, tapping or similar operations are to be performed, a rotary index table mounted on the drillpress column offers a convenient and highly efficient means for making a single machine function as a multi-spindle setup.

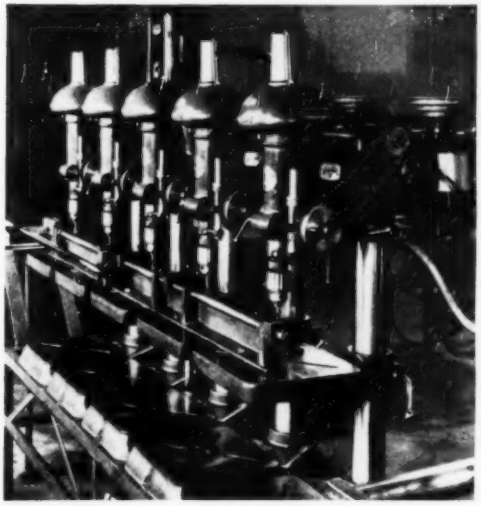
In addition to their use as conventional drillpresses, moreover, advantage is frequently taken of the rigidity and accuracy of the spindles of these machines for many other purposes. Mounted horizontally, and equipped with abrasive cutoff wheels, they are being used for such work as slicing quartz crystals, or provided with chucks and employed as automatic screw machines. One unusual application is that of mounting the drillpress horizontally and fitting the spindle with an air-operated, self-opening diehead for threading small-diameter wires and rods. A simple holding fixture sliding on a table holds the parts in line with the spindle.

A useful surface grinder can be built by mounting a wheel in a suitable adapter on the end of the spindle. A rotary table for surface grinding or lapping may be operated by an auxiliary belt drive from the main spindle. Other unusual applications include pulverizing for laboratory work, using an interme-

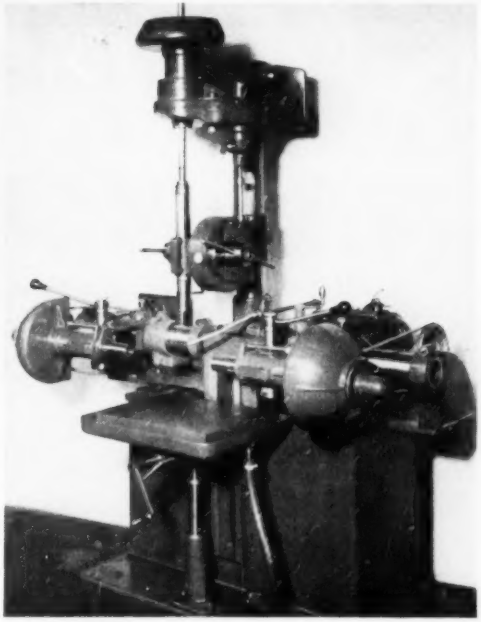


Centering machine constructed from a Buffalo drillhead mounted on a short column attached to the end of a section of I-beam. Vise and work support are adjustably mounted on the top flange

Pedal arrangement attached to the bottom of the column operates the feed levers of two horizontally mounted Buffalo drills for simultaneous drilling of both ends of a workpiece



Mounted on a common bench, five Atlas drillpresses have their feed mechanisms coupled to a single lever-operated shaft by chains and sprockets to insure simultaneous operation of all spindles



Special base provides adjustable mounting for one Buffalo vertical power-feed spindle and two horizontal units. Each spindle is operated independently and has individual motor drive

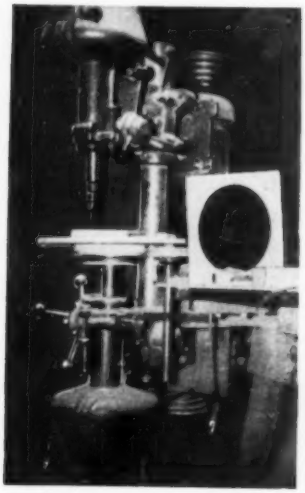
diate pulley mounted on top of the column to reduce the spindle speed; milling, routing and profiling with the aid of a compound vise; polishing, back counterboring and countersinking, and tube flaring.

On occasion, drillpresses have been used as arbor presses, as punch presses for light blanking and forming, and for light riveting. In emergencies they have even served as slotters. Such uses, or abuses, of the spindle are not generally recommended, as they impose stresses which the machine was never

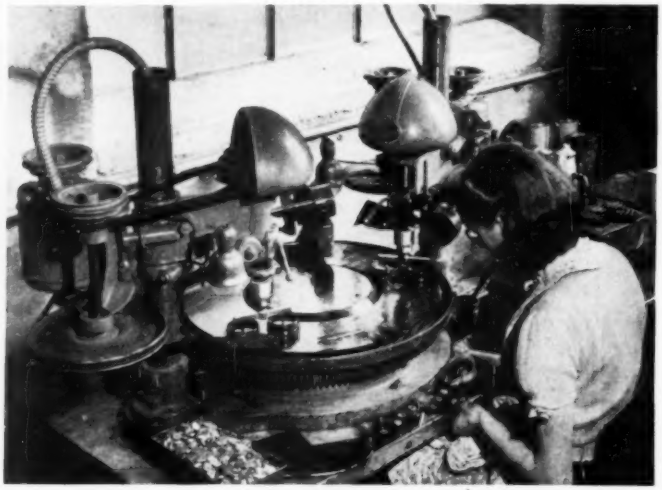
designed to withstand, but it says much for the quality built into them that they do stand up under such conditions and that they can later be returned to normal operation with no apparent loss of their original accuracy.

Old, worn-out machines can be rehabilitated by retaining the base, which is frequently still in good condition, and fitting a standard drillhead and column on top of the old table or on the back of the old base, or the drillhead alone can be mounted on the arm of an old radial drill which might otherwise be discarded.

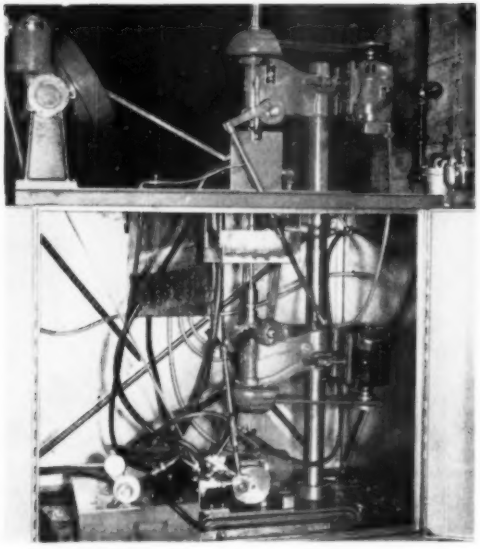
Of the thousands of examples in use in shops of all sizes and in all parts of the country, it is impossible to show more than a few representative cases, but these should serve to give a general idea of the possibilities for cost cutting inherent in light drill-presses.

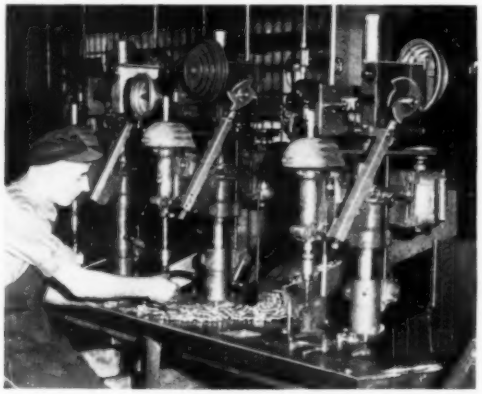


Functioning as a vertical lathe, the upper Canedy-Otto head operates at 6000 rpm on special bearings and performs a routing operation, the form of which is determined by a cam-actuated, slow-speed lower workholding head



Extra pulleys slow down the spindle speed of two Delta drillpresses used for lapping valve parts. Work is held in special fixtures on the spindles which rotate them on the slowly turning lapping plate



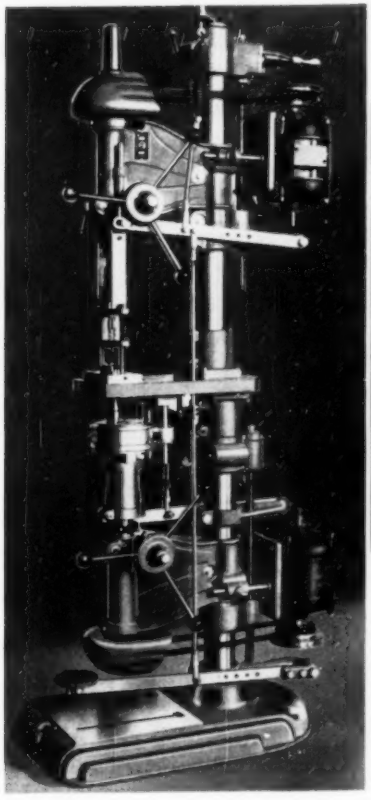


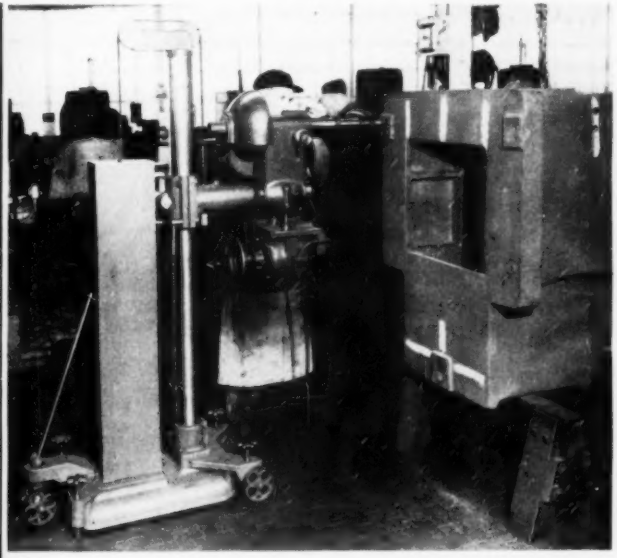
Automatic cam feed applied to Atlas drillpress is driven by ¼-hp. motor and gear reduction. Cam, shaped to produce the desired feed action, operates a rack which meshes with a pinion on the feed shaft

← **Simultaneous** countersinking of both sides of cigarette lighter wheels is performed on this hopper-fed, cam-actuated setup built around two standard Atlas drillheads. Work is held in an automatic air vise

Holes in bathtub flanges are drilled without handling the heavy casting, by employing a three-legged spider base on a standard Delta drillpress. The unit slides easily on its supports for locating the holes

Inverting the column and mounting it on the ceiling permits a Walker-Turner unit to be used for drilling on an assembly bench without lifting the work on and off a conventional drillpress table



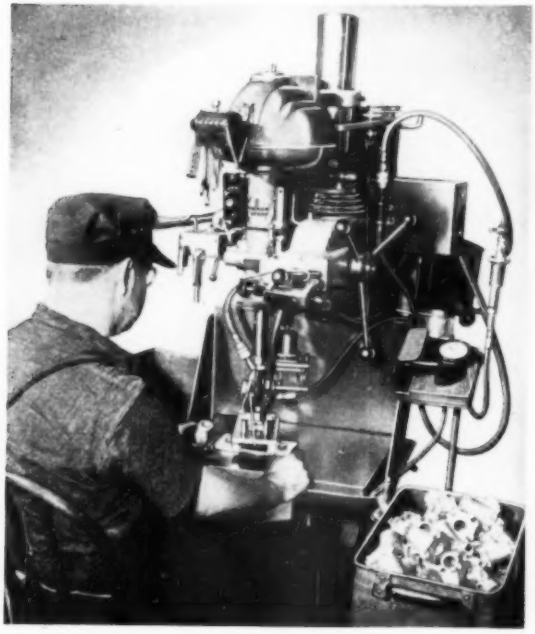


Bringing the drill to the work solves many problems where heavy machine parts are involved. Drillpress is a regular Buffalo unit equipped with a special arm and with wheels and jackscrews mounted on the base

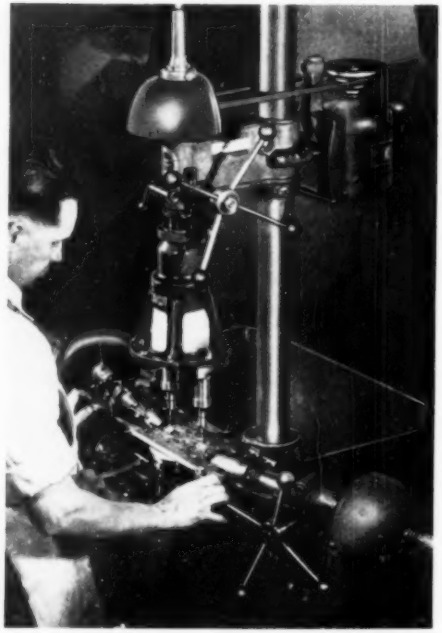
Foot lever on this Atlas drill advances two drillheads simultaneously. The upper head drills six 0.101-in. holes through the workpiece from the top, and the lower head drills two 0.120-in. holes $\frac{1}{8}$ in. deep

Ceramic laps operated by standard Atlas drillpresses are used in the production of crystal holders and other precision radio insulator parts. Spindle speed is reduced by special pulleys

Depth gage indicator on Walker-Turner drillpress is calibrated to the balancing machine scale and shows the amount of metal to be removed for obtaining correct balance of small motor rotors



Power-feed Walker-Turner drillpress with special jig and pneumatic control incorporates counter and indicator gaging setup, and doubles the output of a variety of small parts



Multiple drill head on a Walker-Turner machine drills two No. 41 holes through an aluminum workpiece, and then two angularly disposed horizontal heads drill No. 43 holes to intersect these

ROUND TABLE

Hard Sense or Hard Head?

"Ed," frowned Al, "You and I have been sweating over that forming die for the hood front for, going on a week now."

"You're telling me, Al! If I know anything, we're still sweating over it."

"Of course, Ed, we'll lick it eventually, but the going's tough."

"You're leading up to something, Al—come on, get to the point."

"The point is this, my friend: We're often confronted with difficult problems and attempt to solve them by ourselves."

"Why not? Isn't that what we're here for? Aren't we supposed to be the super-brains around here?"

"Supposed to be, Old Timer, but we're not by any means."

"So you think we're not capable of handling our jobs?" frowned Ed. "What do you plan to do, advertise for a Brain Truster to get us out of the hole?"

"We know the results of depending on boardheads," retorted Al. "I have a better idea that should do some good in practice."

"Now we're getting somewhere—lead on, MacDuff."

"We have a gold mine out in that shop, Ed, and fail to work the proper vein. Now you take Sampson, for instance; that fellow's been around lots and should have some good ideas tucked away in his noodle about difficult forming jobs—used to work for the Excelsior Stamping Company for about four years before he came here."

"What do you plan to do, Man," flared Ed, "let the men know we're licked?"

"Oh, I wouldn't look at it that way, Ed. You know darn well that there are men in the shop who have had quite a spell of experience on various phases of die construction—the chances are that one of them can give us a hint that will lead to some solution."

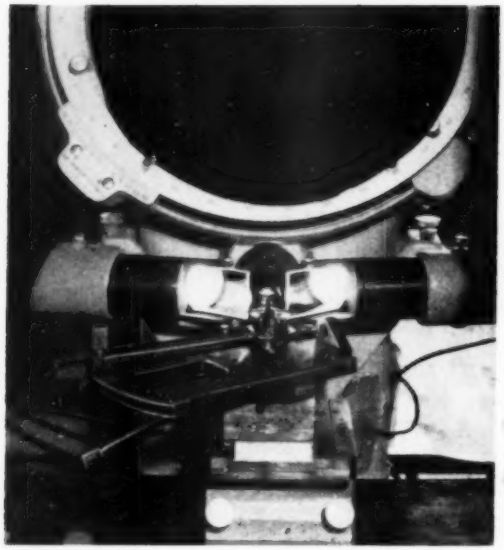
"Here we hire men to do as they are told, and you come along with a suggestion that they be asked to help us plan!"

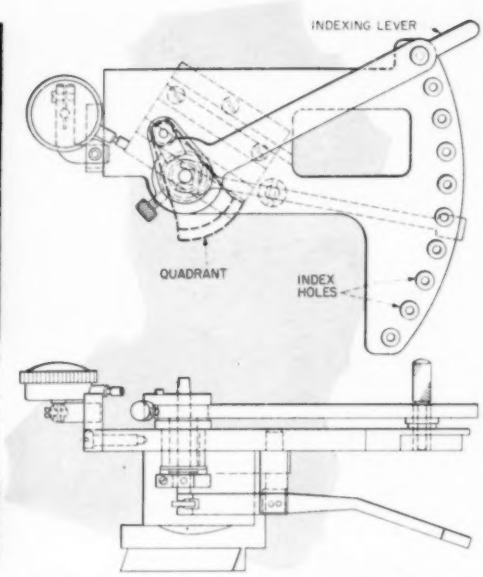
"From my viewpoint, it is just a matter of recognizing the fact that they might possibly have something in those brains of theirs that might fit in with what we are hoping to do."

"I don't profess to know it all, Al, but I do have a certain amount of pride."

"Well, Ed, don't forget that pride goeth before a fall—better be thinking about it."

***SHOULD MEN** be treated as "shop help," or should their hobbies, previous experience or other qualifications be called on in need? If they are so used, how can the proper balance be maintained? Your ideas and opinions will help others to solve their problems.*





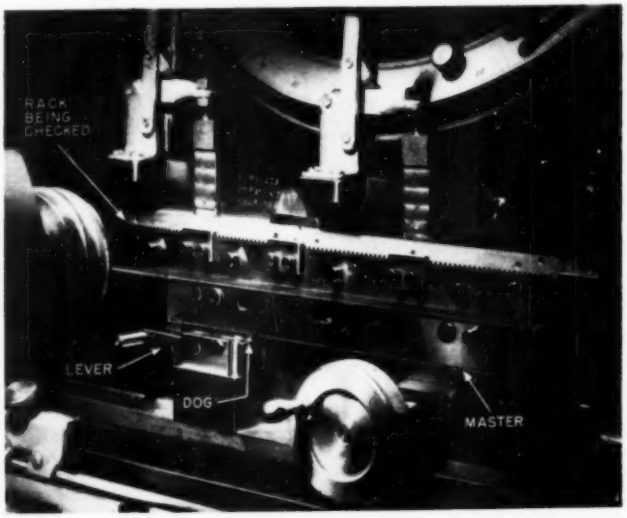
Spacing of numerals on quadrants is checked to ±0.001 in. with an indexing fixture mounted on an adjustable base. The quadrant is slipped over a pivot and onto a locating pin in a member fixed to the indexing lever. By moving the indexing lever to successive index holes and observing the image of the respective numerals on a translucent chart gage, the spacing of the numerals is checked. Reflected light is used in this setup

COMPARATOR ACCESSORIES

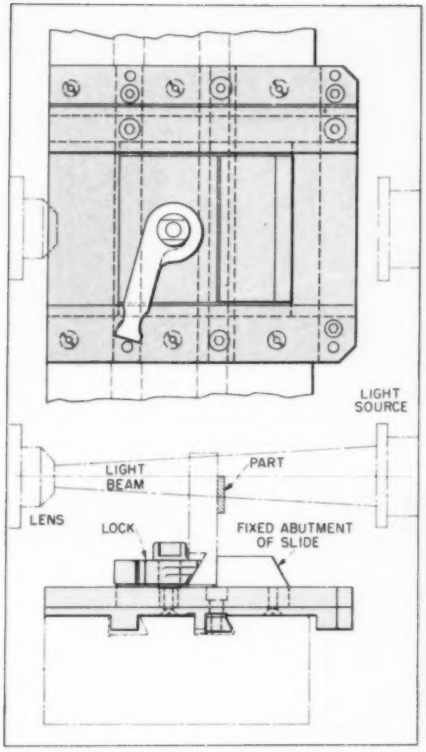
SPEED INSPECTION

BY HERBERT CHASE

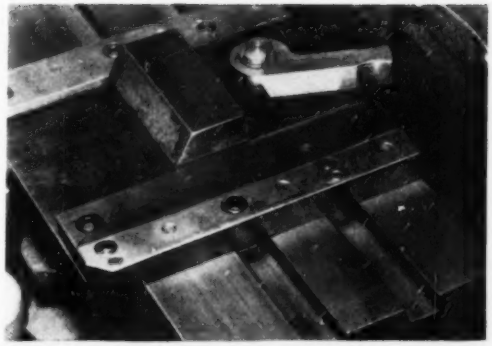
FIXTURES enable the users of optical comparators to save time in making setups for projection gaging. The Endicott, N. Y., plant of the International Business Machines Corporation has developed an adjustable fixture base that is applied to the tables of all bench-type Jones & Lamson comparators used in the shop. With this base, it is possible to position the fixture exactly where desired in relation to the lens system of the comparator.



Elaborate fixtures are required for checking tooth spacing of racks and even the tooth contour. Checking of a spacer bar is shown being done against a master which is locked to the lower edge of the table. Below the hardened master, there is a dog on a pivoted lever, and the dog is engaged with the desired checking notches. Since the rack and the master are correctly aligned before inspection starts, the operator can easily find any error in tooth spacing, say at every seventh tooth, by observing the chart gage. In business machines, this setup reveals precisely how far the carriage will move from position to position and whether the movement is within allowable tolerance



Adjustable fixture base simplifies getting a sharply focused work image precisely located on the comparator screen or chart gage. Transverse positioning and locking of the base to the comparator table is provided by keys; a slide provides in-and-out movement of the work for focusing. A locking plate with an angular face clamps the work fixture (Photo at top right)



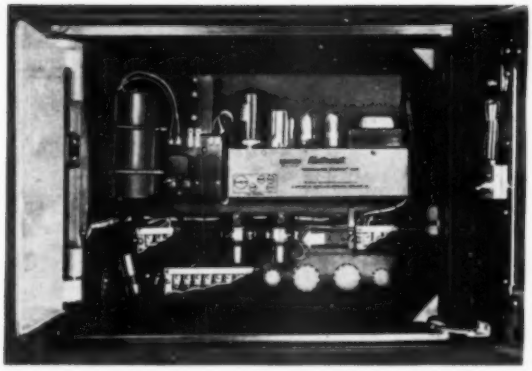
Indexing plate mounted on an adjustable base provides the means for checking angular location of elements in an assembly or part. Here the plate has two holes 90° apart, through which the light beam can be passed. Angular location of the elements of the part is established by rotating the plate until a pawl fits in a notch, observing the screen, then indexing again. Any deviation in angular spacing can be detected and measured if the comparator screen is equipped with chart gage

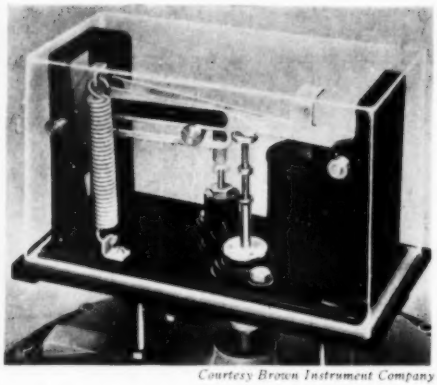
Tips FOR TOP SHOP MEN

286 Pre-employment testing not only doesn't solve all personal problems—it may intensify them. When you start with good workers, you must work extra-hard to keep them good and to get the *most* from their potentialities.

287 You've no doubt classified some new executives as "getting the big head." A certain amount of increased self-importance is normal, but some men can't help becoming arrogant and cocky when they get the chance. If the latter situation develops, you'd better deflate heads before they burst.

"Let's look alive, Smorp!"





Courtesy Brown Instrument Company

Inside views of typical temperature control devices: Left—Strip-chart electronic control potentiometer. Right—Valve-positioning controller

WHAT'S INSIDE TEMPERATURE CONTROLS?

PART 2: Electronic controls will provide four basic types of timing for heat-treating processes, and are found in relatively inexpensive commercial devices

BY DAVID FIDELMAN, ELECTRONIC CONSULTING SERVICE, N. Y. C.

AUTOMATIC temperature and timing controls considerably improve the quality and uniformity of work produced by heat-treating processes. And by development of the electronic-type controls, much closer regulation of temperature and time are available to the user. In fact, it may be said that such controls are within the reach of even very small plants.

The basic requirements of an automatic control system for furnaces was outlined in Part I (*AM*—Vol. 93, p. 94). To continue the discussion let it be said at the outset that there are essentially only two types of functions which the control circuit may be called upon to perform. One is to regulate the amount of electrical driving power applied to the system, as in the case of resistance furnaces and high-frequency heating. The other is to regulate fuel flow by valves and dampers. These devices are

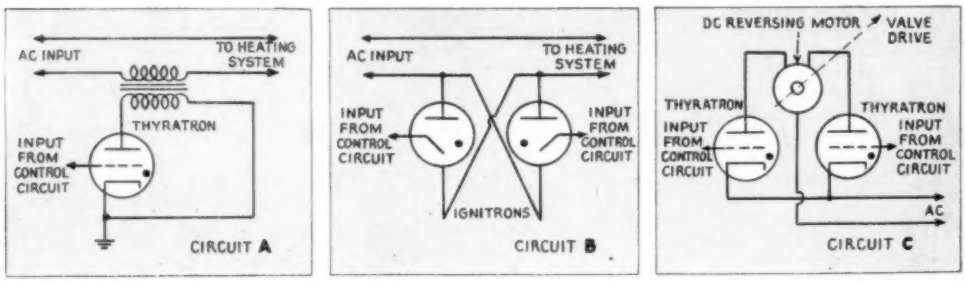


Fig. 5—Control of ac heating current can be effected by Circuits *A* or *B*, in which electronic tubes act as variable resistances to control power flow. Mechanical actuation of dampers or valves is feasible with two electronic tubes, Circuit *C*, to control a dc reversing motor. Electronic devices operate positively and are long-lived

operated either (a) electrically by solenoids, electro-magnets, or small electric motors, or (b) by a smaller hydraulic or pneumatic system controlled by the electrical circuit.

The amplified power may be used to operate the heat controller according to any desired system of control. The simplest system is the basic two-position, or on-off, type of control in which the electrical current from the amplifier serves merely to turn the heater on or off according to whether the temperature is too low or too high. This system may be used in many applications where the sudden changes in the heating rate are not objectionable, especially where extreme precision of temperature control is not required.

More precise control systems make use of continuous variation of the electrical control current. Once the correct operating temperature has been reached, any variation results in an automatic change in the heating rate to maintain the temperature at the correct point.

Various methods for automatic continuous control of heating rate by means of the electronic control circuit are illustrated in Fig. 5. Continuous variation of electrical currents may be obtained by use of Thyratron or Ignitron circuits as shown by Circuits *A* and *B*. In these circuits the Thyratrons or Ignitrons control the current by taking the place of a variable rheostat in the control circuit, so that the resistance (and therefore the current to the heating equipment) is controlled by the grid voltage supplied by the electronic circuit. Since the effective resistance of the Thyratrons can be varied continuously over a very wide range, close control of the heating power may be obtained.

Another method of obtaining continuous control of heating power is by means of the saturable-core reactor, which also acts as a valve to regulate the amount of electric power which flows through the circuit into which it is connected. The saturable-core reactor consists of a laminated iron core upon which are two ac windings (through which the main current flows) and a dc winding. The current in the dc winding, which is supplied by the electronic control circuit, controls the amount of current which can flow through the ac windings, thus regulating the heating power.

The electronic circuit may be made to control the motion of a motor by the method shown in Circuit *C*, Fig. 5. The Thyratrons can control the amount and polarity of the current to drive a small dc reversing motor in either direction. The motor can be coupled to a valve, damper, potentiometer, or any other type of mechanical controller, and regulate the control according to the amplified voltage from the thermometer in such a manner as to maintain any desired temperature. The electronic-tube circuit may also be used to control the speed of a motor according to the thermometer voltage, by controlling the field excitation of a dc motor, or by means of certain other types of variable-speed motors which can be controlled by dc. This method can be used to regulate the speed of conveyors according to the temperature, in any case where this may be desirable.

Potentiometer Control System

Another method of control makes use of what is known as the "self-balancing potentiometer" system of control. This system is illustrated in Fig. 6 as used with a thermocouple. The circuit also has the feature that it converts the dc from the thermometer to ac before amplifying it.

The potentiometer is connected across a battery, and the voltage of the slider is balanced against the voltage produced by the thermocouple. The difference between the two voltages is converted to ac by a mechanical vibrator. The vibrator may consist of a flat metal reed, which is caused to oscillate between two contacts by the ac supply voltage. If there is any difference between the voltage of the thermocouple and the potentiometer voltage, this differential voltage then goes through the transformer as ac and is amplified.

The amplified voltage operates a motor, which is connected back to the potentiometer slider, and the voltage causes the motor to turn in the direction which will bring the two voltages into balance. If

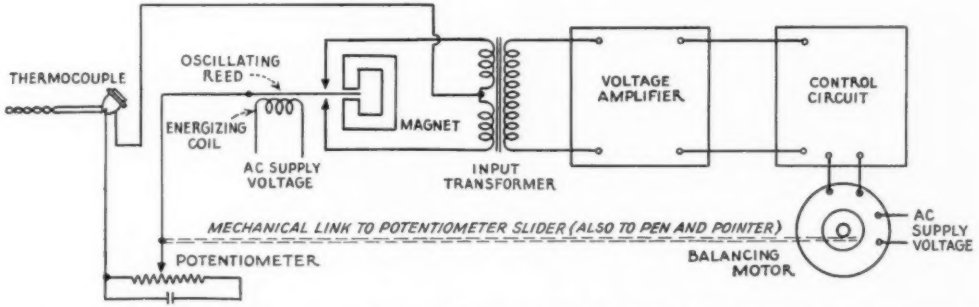


Fig. 6—In this self-balancing system, the difference between voltages of thermocouple and potentiometer is converted to ac, then amplified and fed to a balancing motor, which moves the potentiometer slider until it again reaches a position equivalent to zero voltage differential. This process is repeated as necessary

the potentiometer is connected to a mechanical pen recorder or pointer, its position will then be an accurate indication of the thermocouple reading (and hence of the temperature). If the motor is connected to a temperature control, so that any change in temperature causes a corresponding correction in the heating rate, then accurate control can be obtained at any desired temperature.

This combination of a self-balancing potentiometer and ac amplification can also be applied to the two other temperature measurement systems, and is capable of giving rapid measurement response and extremely sensitive control action.

Automatic Timing Controls

Many heat-treating processes depend not only upon the accuracy to which the desired temperature can be maintained, but also upon the time for which this temperature is maintained. In some processes, several different temperatures must be maintained for different periods of time. If uniform quality of heat-treating is to be obtained, the timing as well as the temperature should be reproduced accurately for each object that is being processed.

In all heat-treating processes there is some minimum time during which the material being treated must remain in the furnace at the required temperature. This interval must be at least sufficient for the material to reach the treatment temperature. Even though there is no limit to how long the material may remain at this temperature, maximum efficiency is obtained when the material is not kept in the furnace longer than necessary to complete the heat-treating process. The use of automatic timing methods insures accurate and reliable control of heat-treating times, and in particular is a necessary factor in any system that is being set up for completely automatic control.

When fairly long time intervals, generally 4 min. or longer, are involved, good results can be obtained

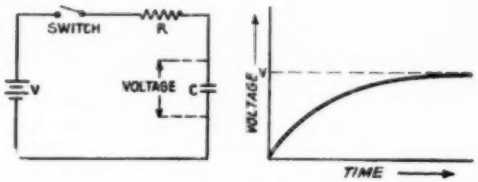


Fig. 7 At left is the circuit used to determine the time required for a condenser to charge from a battery through a resistance. At right, the voltage across the condenser increases as a function of time

with mechanical or electromechanical timers. These generally consist of a motor connected through a set of gears to some cam or mechanical switch that is connected to the equipment to be controlled. Timing can be changed by varying the speed of the driving motor or by changing the gear ratios.

This method is of considerable importance in automatic conveyor heat-treating systems. Here the time of heat-treating depends upon the time it takes the object to move through the furnace. By driving the conveyor with one of the standard commercial electronic variable-speed motor control units, extremely accurate adjustment and control of the conveyor speed—and hence of heat-treating time—may be obtained. In certain cases it is also possible to connect the temperature-control system to a variable-speed motor control in order to obtain automatic adjustment of the conveyor speed according to the actual furnace temperature.

When it is necessary to control shorter time intervals, ½ sec. to about 4 min., best results can be obtained by the use of an electronic timer. This device will generally offer greater flexibility and accuracy at lower cost than mechanical timers, and it is readily adaptable to changes in the timing interval and timing combinations.

Electronic timers are based on the principal that when a battery is connected through a resistance to a condenser, an appreciable time is required for

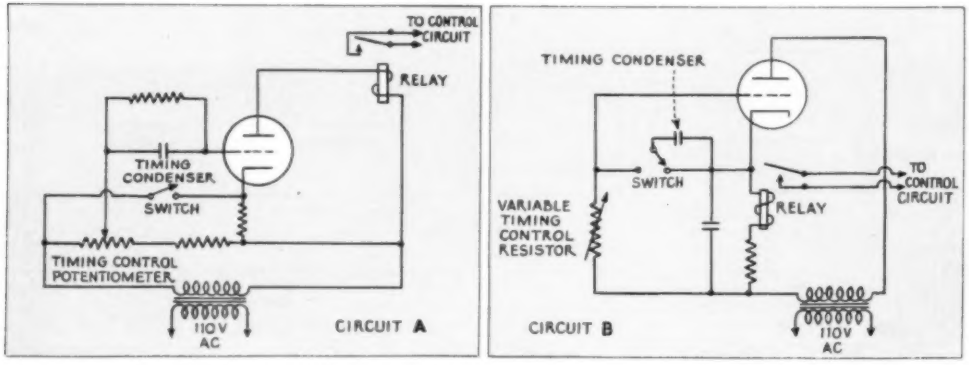


Fig. 8—Basic electronic timing controls are: Circuit *A* incorporates a relay that operates a given time after the switch is closed; Circuit *B* has a relay that closes for a definite time after the switch is closed

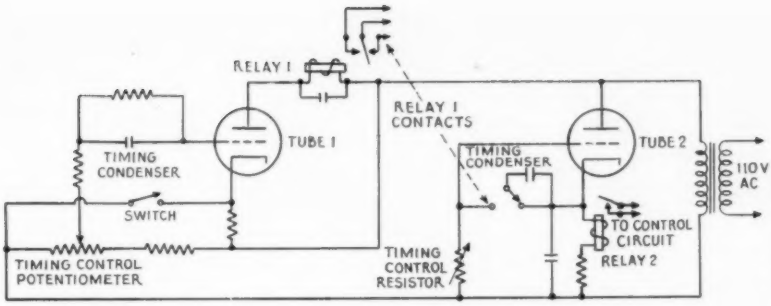


Fig. 9—Both circuits of Fig. 8 are here combined to produce an electronic timing control which will close a relay for a given time interval at a desired time after the initiating switch is closed

an electrical charge to accumulate upon the condenser. A graph illustrating the process of condenser charging is shown in Fig. 7. If resistance in the circuit is increased, the charging time becomes greater. Thus, the time may be controlled simply by means of a potentiometer or rheostat. And the time required for the charge to reach a specific value may be used to control the operation of an electronic-relay circuit. Examples would be: to delay an operation for a given time, or to perform an operation for a given period of time, or in almost any complex multiple sequence of delay and operating times.

Two basic electronic timing circuits are shown in Fig. 8. In Circuit *A* the control relay operates a given time after the switch is closed. Operation of this circuit may be explained briefly: When the switch is open, the condenser is charged by grid current in the tube. As long as the switch is open the tube cannot conduct current. When the switch is closed, the tube current does not flow until the condenser charge is dissipated through its resistor. The time required for discharge provides the desired time delay.

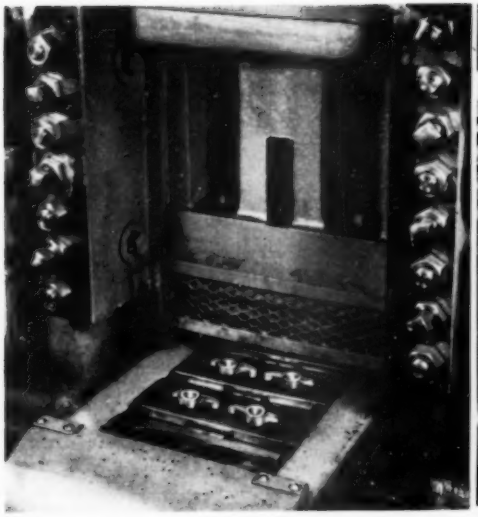
In Circuit *B*, Fig. 8, closing of the switch causes the control relay to close for a definite time and then release. In this circuit, cathode resistance is high enough so that normally the tube current is less than the operating level of the relay. When the switch is thrown to position 2, the tube current rises sufficiently to close the relay. At the same time, the condenser begins to charge through the resistance and the tube current gradually approaches its normal value. When the current has decreased sufficiently, the relay again opens. The length of time the relay stays closed is controlled by the setting of the timing-control potentiometer.

These two circuits can be combined, Fig. 9, to obtain a more complex timing sequence. The result is a timer that will close a relay for a given time interval, at a desired interval after the initiating switch is closed. The delay before the control relay closes is obtained by using Circuit *A* of Fig. 8, connected so that its relay initiates operation of a circuit like that at *B*, Fig. 8, to keep the control relay closed for the desired time. Opening the switch resets the timer for the next operation.

Circuits of this type may be combined to give any of the four basic types of timing operations—interval, delayed action, automatic repeat, and programming—and combinations and variations of these operations. Electronic timers of this type are available in inexpensive commercial units which are capable of giving various combinations of timing operations, and will time accurately any interval between 1/20 sec. and 4 min.

The development of these electronic controls has placed modern heat-treating instrumentation within the reach of even the smallest plant, and has simplified automatic handling in heat-treating processes to such an extent that it is gaining increasingly wide adoption for quantity production. Through use of electronic controls, maximum production speed and product uniformity, together with minimum spoilage, are attained.

"Lessee—this one's the engineering dept.; this one the forge shop; this one the pattern shop. . . . Are security regulations worth all this bother?"



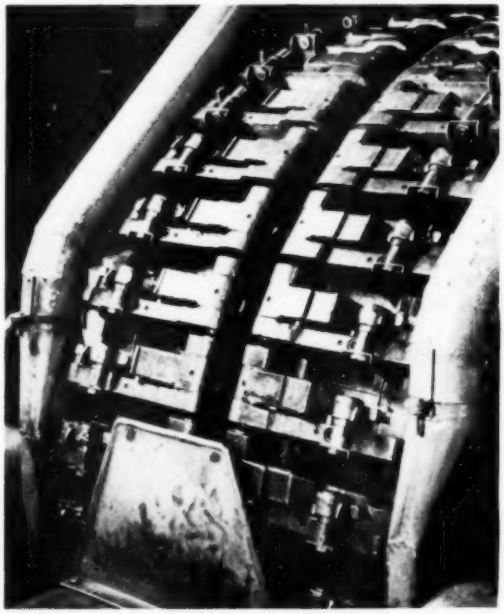
Coining produces a fixed diameter and taper on outside edges of rocker arm hub for subsequent location while drilling and reaming the rocker-shaft hole. Metal is compressed 0.020 to 0.045 in. and hub ends made parallel and at right angles to hole within 0.010 in. A continuous conveyor feeds malleable castings to the coining press by twos at 10- to 12-sec. intervals

Conical bushings in the fixture of a drum-type machine clamp the rocker arms by the coined hub ends. Thus, the drilled and reamed hole will be square with the end faces. Each fixture holds two pieces

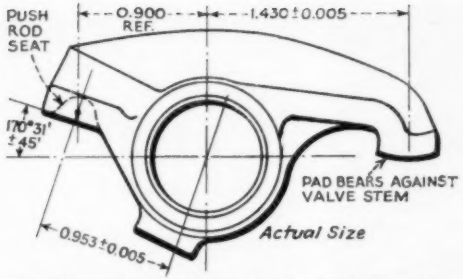
SPECIAL EQUIPMENT FINISHES OLD'S ROCKER ARMS

BY CHESTER RICKER, DETROIT EDITOR

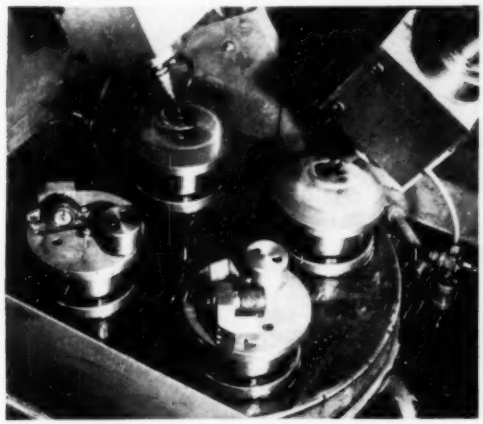
OVERHEAD valves are used in the new Rocket V-8 engine installed in two lines of 1949 Oldsmobiles. Because this is a new engine, the Lansing plant could start from scratch in selecting processing methods. The rocker arms are a good case example of special-purpose tooling chosen to obtain high precision. After the malleable castings are machined, wearing surfaces are induction hardened and oil quenched to a hardness of 50 Rockwell C scale.



Radiused pad that bears against the valve stem is form-milled on a drum-type miller with duplex fixture layout. Each rocker arm is located by a pin entering the drilled and reamed shaft hole and is held down in the fixture nest by a clamp which is automatically operated



Close dimensional and angular relationships must be maintained when machining the rocker arm.

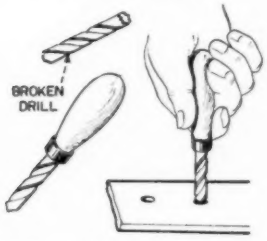


Push-rod sockets are generated and polished to a perfect ball seat by this two-spindle honing machine. Two parts are finished per cycle. Desired finish and geometry are produced by selecting suitable angle for the polishing spindles and rotating the work

Rocker-shaft holes are precision bored on a four-spindle machine. Operator is shown loading the four chucks (other side of conveyor belt) by means of a feed fork (pivotably and slideably mounted). Ball detents in feed-fork tines engage the oil holes in rocker arms so they are properly oriented with chuck jaws. When chucks release at end of boring cycle, finished parts fall onto conveyor belt and are carried away

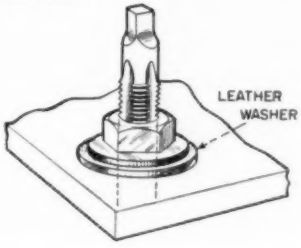
Short Cuts FOR THE SMALL SHOP

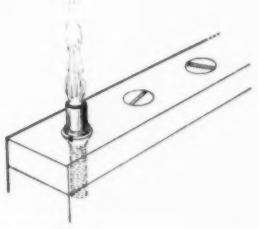
BY A. H. WAYCHOFF



BURS IN DRILLED holes and punched holes are easily removed with this tool. Take a broken drill, grind the end, and drive the shank into a file handle. The tool quickly removes light burs.

HAND TAPS are often started with the aid of a nut in order to keep them square with the hole. But the steel nut may start to act as a locknut. To avoid this, slip a steel washer and a leather washer under the nut.

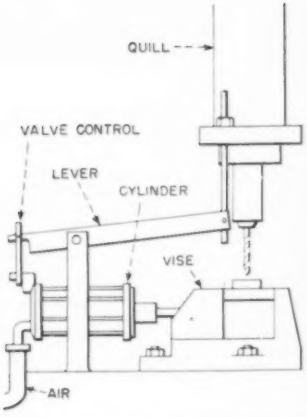




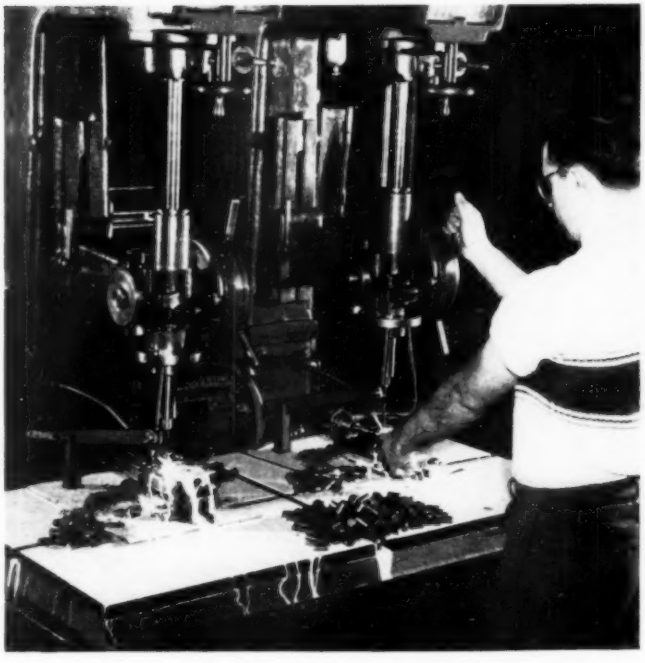
TO REMOVE a tight machine screw, place a discharged 22-cal. cartridge shell on top of the screw head, fill with alcohol and ignite. After the contents have burned out, remove the cartridge, and it will be found that ordinarily enough heat has been transmitted locally into the assembly to permit removal of the screw.

SHOP SHOTS

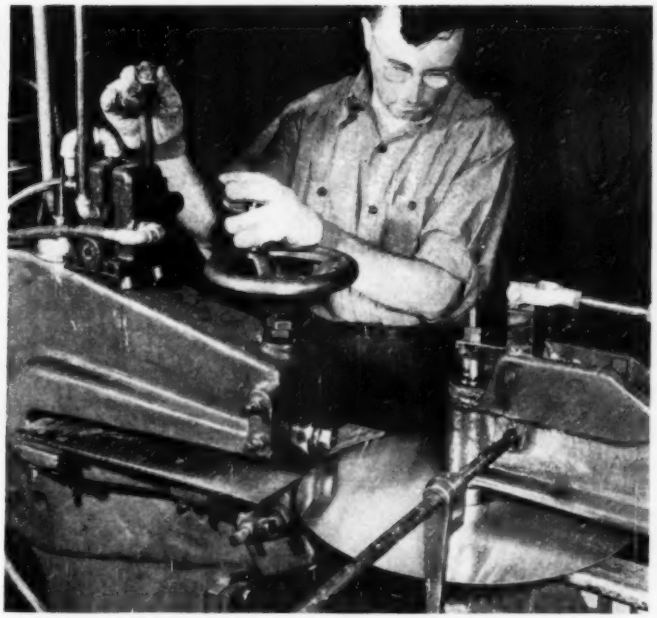
Bevel gears and pinions for tractor steering mechanisms are produced in equal quantities for even flow on one lathe with dual tooling. Alternate setups of segment blanks on stepped mandrels are made with rear slide near headstock cutting gear and front slide near tailstock cutting pinion. Pinion mandrel, seen lying on front of machine, is reloaded while gear is being turned. *Tractor Div., Allis-Chalmers Mfg. Co.*



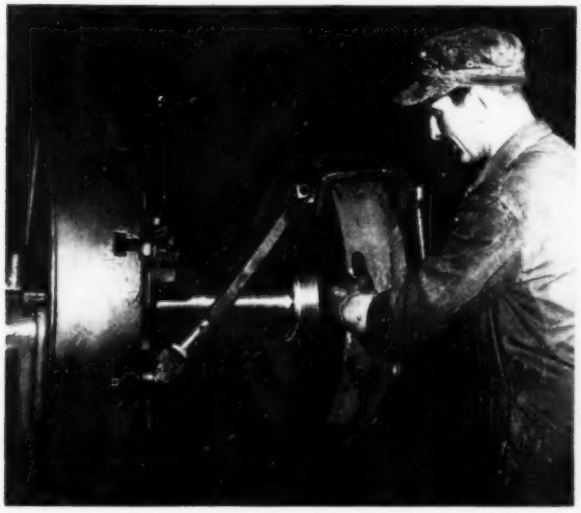
Air-operated Bellows vises, clamping alternately, are connected to automatic feeds of Leland-Gifford drill-press through levers to quills. Special jaws and guide bushings position parts and drills for automatic operation that saves 75% of the work time over conventional hand operation of vises and feeds. *Allis-Chalmers Mfg. Co.*



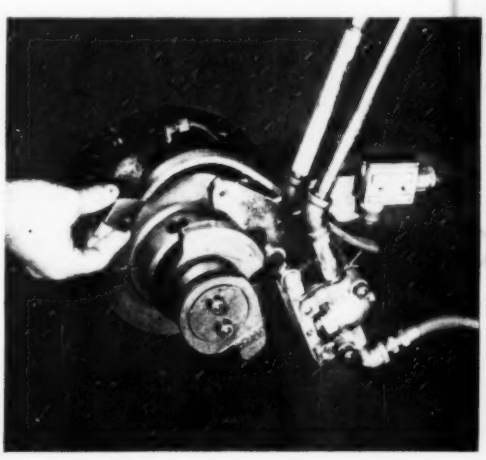
Mounting bracket holding a Thor bench screwdriver contacts normally open Micro Switch when operator depresses pedal to start up screwdriver. After screw is driven, operator releases pedal and screwdriver returns to "up" position and releases switch. Result is quieter operation and current economy. *Micro Switch Div., First Industrial Corp.*



Punch for center added to circle cutter allows two operations at once on blanks for air-diffuser cones. Combined cutting on 2- to 7-ft.-dia. disks saves 20 manhours a week. *Anemostat Corp. of America.*

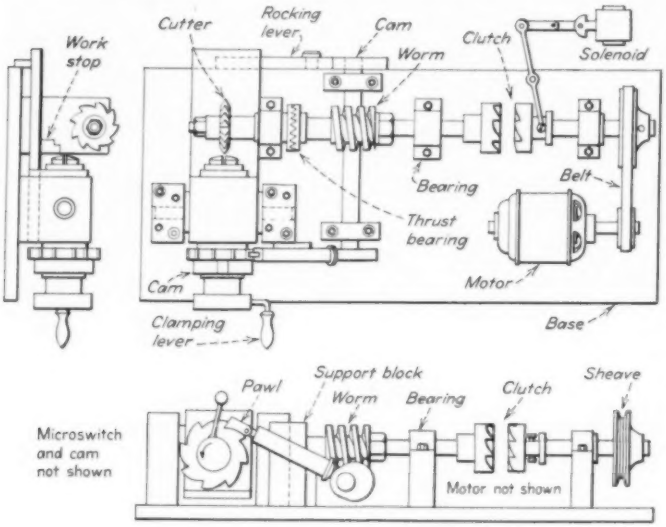


Axle journals are turned and wheel hubs are faced in a 36-in. engine lathe with a setup that saves marring of journal surfaces by the older chuck-jaw setup. Large C-clamp fits over wheel flange, is connected through 20-in. driving arm to universal-joint driver bolted to chuck face. Axles and wheels for "S" engines, trailers and tank trucks are turned this way. *Hornell Locomotive Shops, Erie Railroad Co.*



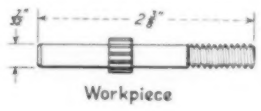
Weighted guard arm releases normally open Micro Switch to cut out motor power when operator raises it to check die setup by turning crankshaft. This prevents operation of Henry & Wright dieing machine until operator drops arm back into position to depress switch and energize pushbutton again. *Micro Switch Div., First Industrial Corp.*

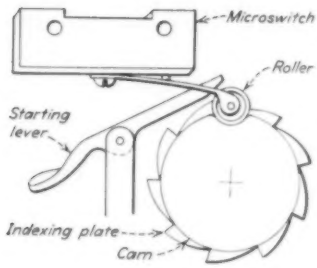
Practical Ideas



Shop-Made Pinion Cutter Operates Automatically

A 1-IN. STEEL BASEPLATE mounted a setup made for producing small pinions on turned shafts which were threaded at one end. Tolerances for the job were loose, so it was possible to raise the work vertically into the rotating cutter.





The machine was made from stock parts and assemblies, together with a few special parts.

A guard protected all moving parts except the collet body and the clamping lever, and the base was fitted with a bed pan and a circulating oil system. Power was provided by a 1/3-hp. electric motor mounted on the base which drove the main shaft through sheaves and a V-belt. A second shaft was driven through a worm and gear from the main shaft.

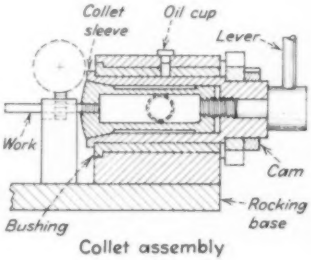
The clutch was thrown by a 25-lb. solenoid energized through a normally open Microswitch mounted above a cam on the collet shaft. An operator started the cycle by depressing a lever which raised the roller on the switch arm. When the cam had rotated around to the starting position, the roller dropped back into the depression on the cam and stopped the action.

The main shaft rotated at 575 rpm., a 1/3 reduction from the motor, and the cross shaft rotated at 19.25 rpm., which indexed the work after each 30 revolutions of the cutter. Both shafts were supported in bearing blocks.

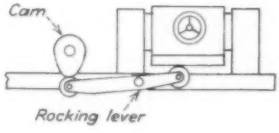
At one end of the cross shaft a cam operated an indexing pawl that operated against an indexing plate on the collet shaft. This turned the work to nine positions (nine teeth on the pinion). Another cam at the other end of the shaft operated a rocker arm with rollers which raised the end of the collet assembly to move the work into the cutter, but to drop it out so the work could be rotated to a new position. In this way all nine teeth were cut on each blank, with the machine operating continuously until the roller on the switch arm dropped into the depression on the cam to stop the machine.

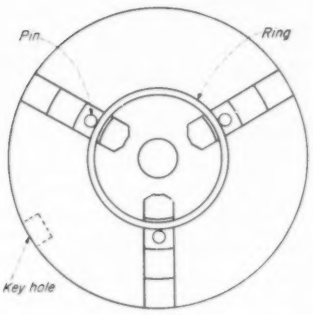
Pinion blanks were turned on 7/32-in. shafts, with the pinions having a 0.343-in. O.D. and 32 pitch. The work was chucked in the collet, which was closed by the chucking lever, and was located against a stop under the end of the collet.

Although this was a specialized machine, many of the principles and parts involved should be of use and interest to many shops. *Joseph F. Budnick, Bellerose, N. Y.*



Collet assembly





Chuck Jaws Clamped on Ring For Truing Up by Boring

I FOUND IT impossible to chuck anything exactly true in an old 16-in. engine lathe that mounted a 10-in. universal chuck that had seen quite a bit of service. Since I was doing maintenance and toolroom work, it was necessary to have accuracy, so I annealed the chuck jaws with a torch in preparation to machining them from a toolpost.

Then I drilled a $\frac{3}{8}$-in. hole in each jaw in the same radial position on each jaw and inserted steel pins. These held a steel ring when the jaws were clamped down. The jaw ends were machined with a boring bar.

The three steps on each jaw were machined with the boring bar after the ring had been chucked internally. Despite play in the scroll, the chuck now is accurate, especially since I have marked one key hole to be used for all tightening. *Thomas Gray, Belfast, Northern Ireland.*

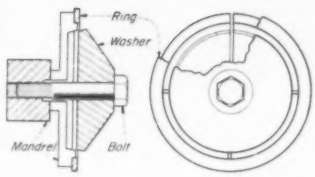
Spring Mandrel Clamps Rings For Accurate Machining

MANY SHOPS have trouble in machining thin, large-diameter rings with any practical precision because when the rings are chucked the uneven clamping force makes them bow out between jaws. This results in rings that are not really circular. We were bothered by this problem until after we made a split mandrel that supported the rings all around the inside diameter to eliminate twists and bends.

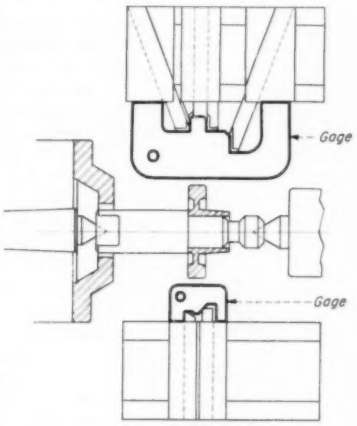
The mandrel itself resembled a spring collet, and was, in fact, held in the lathe inside a spring collet. The solid left end was drilled and tapped to receive a bolt that tightened the four sectors of the right end.

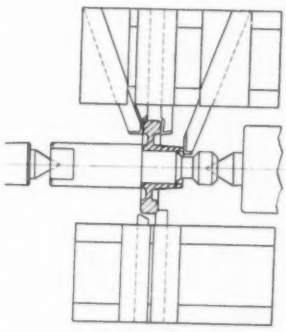
A 15° taper was machined on the inside shoulder of the four sectors, which matched a similar taper on the large washer. The outside edges of the sectors were turned to fit the I.D.'s of the rings, so when the bolt was tightened it expanded the sectors against the rings and clamped them firmly, with no distortion and with little pressure required.

In this fixture the O.D., one face



and two chamfers are cut on the rings. Another spring collet, machined with a 5-in. counterbore to fit the finished O.D., held the rings for cutting the I.D., the other face and two more chamfers. Production was increased four times over the former method of chucking, and tolerances were held to a thousandth. *Charles Schwartz, Brooklyn, N. Y.*





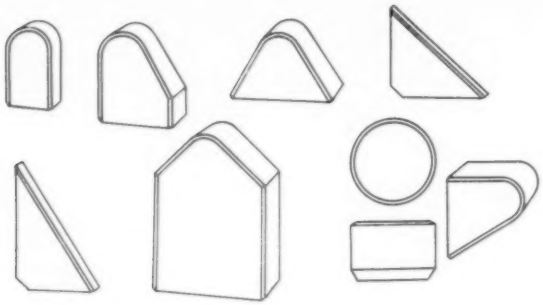
Templet Gage Aligns Multiple Bits on High-Production Lathes

FOR FAST and accurate setting of several toolbits in related positions this gage has proved itself highly satisfactory. It is adaptable to any multiple-tool-holding block such as those on horizontal or vertical production lathes.

The gage is made from tool steel and need be only $\frac{1}{4}$ in. thick for most jobs. After being roughed out it is ground to a layout of the tool locations. The two faces which rest against the toolblocks must be even and parallel, and dimensions for turned diameters are held in relation to these faces.

Toolbits are positioned by holding the gage against the blocks and adjusting them forward until they contact the correct part of the gage. In many cases where one toolbit will not stand up as well as the others, the gage simplifies its removal and replacement.

The gage reduces machine down-time and is both inexpensive to make and easy to use. *Stanley R. Welling, Racine, Wis.*



Standard Shapes for Jigs and Fixtures Reduce Costs

THERE ARE plenty of bolts, clamps, knobs, drill bushings and V-blocks advertised to be attached or assembled to jigs and fixtures after the bodies have been made, but little is said about the body or base itself.

Instead of taking dimensions out of the air, why not standardize on different shapes and components for fabrication so that they can be picked out of a catalog by the designer? This would save time for the draftsman because he would only have to indicate special finishing requirements on numbered shapes, and would save the mechanic's time because the parts would be available to him and he would only have to do a bare minimum of machining to produce the required component.

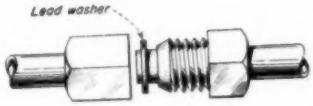
This idea came to my mind a couple of years ago when I had to redesign a testing fixture. We had to produce one in a day and a half as a model for 100 more just like it. These details would have been very handy to me if they had been available at the time. As it was, we had to make the fixtures as best we could, and they cost more than they should have.

I took drawings of punch and die work that we had done and broke the parts down into small details for the purpose of welding the small pieces together to replace the pattern and casting method. Later on draftsmen were instructed to design fixtures so we could use bar stock on hand as much as possible.

Through experience we found that similar details were being made quite often—one or two at a time. This led us to keeping a record of how often similar pieces were being made. We received quite a surprise—the result of which was that we ordered the shop to make them 50 or 100 at a time. This step alone brought the cost of the parts down to about half what it had formerly been.

The illustrated shapes could be made commercially in bar-stock form, with the only changes necessary being to chamfer edges (if required) and to alter some few dimensions as required for a certain job. The draftsman would then only have to draw details of the shapes if changes were necessary.

Savings possible through this type of welded-up bases are obvious. The illustrated shapes are only samples of what could be done in the line of machine-shop and welding-shop ready-made components. *Harold Reaney, Adam Center, N. Y.*



Lead Washer Seals Joint

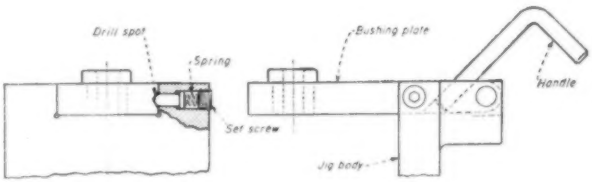
EMERGENCY REPAIR on loose or worn couplings for flexible tubing can be made with a thin lead washer. The center hole should be cut to just fit over the tubing, and the O.D. should be slightly less than that of the coupling. It is fitted over the end of the internal section of the coupling and the coupling is tightened. The joint will be gas-tight and liquid-proof. *Norman W. Wyckoff, Verona, N. J.*

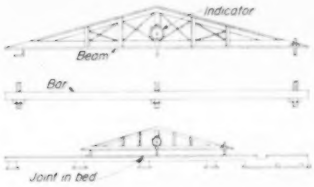
Spring-Loaded Pin Locates Swinging Bushing Plate

JIGS AND FIXTURES can be fitted with retractable bushing plates if the operator must get closer to the work than an ordinary bushing plate will allow. The plate below is quick-acting and locates as positively as if it were fixed.

A hole is drilled, reamed, counterbored and tapped in the side of the jig body for a small shouldered pin that is backed up with a spring and socket-head setscrew. The bushing plate is hinged on a side extension of the jig body, and a drill spot is cut in the side of the plate to seat the pin. The handle is made from a bent section of any convenient rod and is pressed into place.

Pressure on the handle raises the bushing plate against gravity and the holding effect of the spring-loaded pin, and the plate swings out of the way. When it is dropped back into position, the pin seats itself. *Roger Isetts, Kenosha, Wis.*





Three-Point Cantilever Beam Aligns Machine Components

ALIGNMENT in machine setups can be held to an accuracy of five tenths in a length of as much as ten feet with equipment made from materials costing as little as $20.

The device illustrated was made mostly from scrap steel, and the only expensive part was the dial indicator. The straight bar was cut from heavy, rigid stock and was drilled and tapped at three points (the center hole midway between the end holes) for large studs locked by nuts. This bar was necessary simply for calibrating the alignment beam illustrated above it.

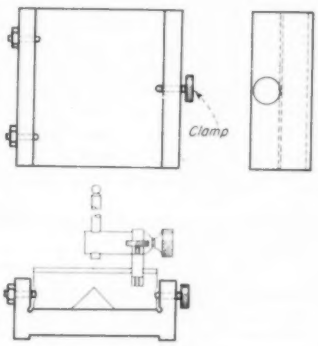
The beam made by welding angle-iron shapes and flat supports together, had a fixed foot at its left end, a large stud locked by a nut at the other, and the dial indicator mounted in the center. It was calibrated by placing it on top of the three studs on the lower bar, which were ground off on the ends to the same length—checked by a micrometer.

The object of the calibration was to obtain a zero reading on the dial when the tip of the dial spindle was exactly in line with the ends of the foot and the stud. This was started by noting the dial reading with the beam on the three studs. Then the beam was lifted and the bar was turned over (not end-for-end). The beam was then lowered again and a second reading noted. The center stud in the bar was then adjusted so the dial read the average of the two readings and the process was repeated for a check.

When the stud had been adjusted so the dial read the same no matter which side of the flat bar was up, the dial was reset to zero at that position and was ready for aligning horizontal machine members.

Due to the weight of the beam, calibration for vertical work had to be done in a vertical position, and slanted work in a slanted position. The beam had to be handled with a gentle touch so that hand pressure did not deflect it.

The original beam was 6 ft. long. Applications included aligning machine beds, checking engine bearings and checking beds for warp. *Michael P. Blake, Charleston, W. Va.*



Non-Magnetic Surface Plate Permits Gaging on Grinder

SURFACE GAGING can be done on a magnetic table or chuck without cutting off the power if an auxiliary surface plate is made of a non-magnetic material such as 18-8 stainless steel. Such a plate could also be made of aluminum or magnesium if the materials are available. However, many stainless steels are magnetic, so one must be chosen that has enough chromium and nickel to make the steel austenitic.

The plate can be milled or shaped to fit under a standard surface-gage plate and clamp it with setscrews. In the illustration the screws are spotted to clamp on the lower halves of the side radii, which will clamp the regular plate downward. *James E. Avery, Pekin, Ill.*

$25 *In addition to regular payment*

for the best PRACTICAL IDEA

An extra payment of $25 will be made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

PAYMENT—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES — A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

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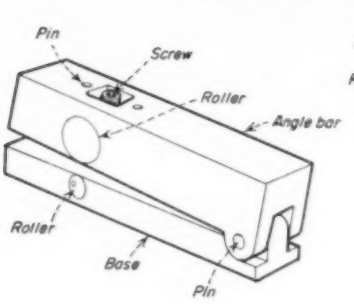
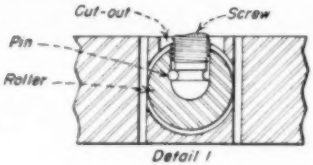
73RD WINNER:

ROGER ISETTS
Boring-Bit Gage





Detail 2

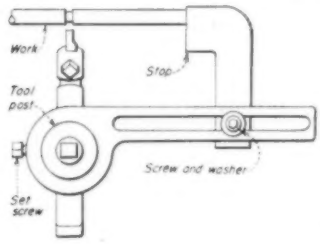
Adjustable-Angle Parallel Positions Work in Vise

ANGLE PARALLELS can be bought in sets, but the design illustrated can be made cheaply in the shop and is adjustable to any angle up to about 15°, or more if the screw is made longer.

This type of parallel can be employed in pairs for setting up work in vises at slight angles. All parts except the screw and standard pins are made from mild steel, hardened and ground. A heavy hinge arrangement holds the angle bar and base together at one end by means of a pin. The axis of this pin must be level with the top of the base and in line with the bottom of the angle bar.

The section at Detail 1 shows how the screw is seated in the base roller. The roller is drilled vertically and a radius is cut in the bottom of the hole. The rounded end of the screw seats in this hole, and is held by a pin through the roller (lengthwise) that nests in a circular groove around the pin.

Both rollers are grooved around their circumferences (Detail 2), and pins driven into vertical holes in bar and base seat in the grooves to retain the rollers in position. The upper roller is tapped for the screw so adjustments made with a wrench in the socket head of the screw will raise and lower the angle bar. Rectangular cut-outs in the top of the base and through the bar allow clearance for the screw. *Allan B. Nixon, Springfield, Mass.*



Stop Clamps On Toolpost

TWO PARTS held together by a screw and a washer form a convenient stock stop that can be attached to a lathe toolpost. The stop piece is hardened for good wearing qualities after it has been drilled and tapped for the screw.

The main body fits snugly over the toolpost and can be clamped by a setscrew. The slot can be made to any reasonable length for many sizes of parts. *Eugene E. Koch, Palatine, Ill.*

Plastic Disks Turned While Held by Tailstock Thrust

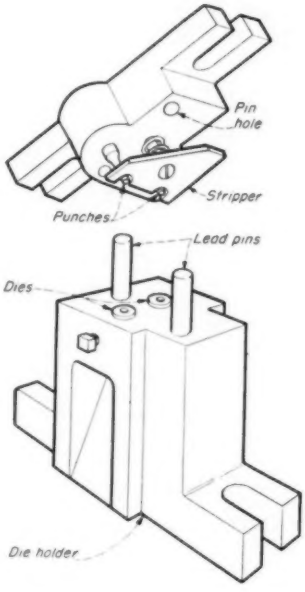
A THIN SHEET of rubber, cemented to the faceplate of a lathe, will prevent plastic disks from slipping out of line when they are being edge-turned. A ball-bearing tailstock center nesting against a centerdrilled metal bearing disk (drilled only part way through) that holds the plastic disk against the faceplate will transmit enough pressure without much friction to hold the plastic in place. *Bernard Levowich, Brookline, Mass.*

Lead Pins Align Holders For Clamping in Press

THIS IDEA is useful for setting up a punch and die in correct alignment when holes are to be punched near the center of a large sheet, and when die sets are out of the question and a floating stripper must be employed.

Two extra mating holes were bored in the punch and die holders to receive large leader pins of $\frac{5}{8}$-in. diameter. The holes in the die holder were bored $1\frac{1}{4}$ in. deep, and those in the punch holder were bored to clear the pins.

After the die holder was bolted down, the pins were inserted and the punch holder mounted on them. Then the ram of the press was brought down to touch the punch holder and this was bolted in place. The ram was raised, the pins removed, and production started with alignment perfect. *Henry G. Berndt, Horicon, Wis.*



New Minimum Wage Probable

WASHINGTON—A new minimum wage of 65 or 75 cents an hour is likely to be passed by this Congress. The House committee has approved a 75-cent minimum and the Senate is beginning hearings on a similar measure.

No legal change is even being suggested in the 40-hour basic work week, although many unions are beginning to agitate for a shorter workweek as an alternative to layoffs when production cutbacks occur.

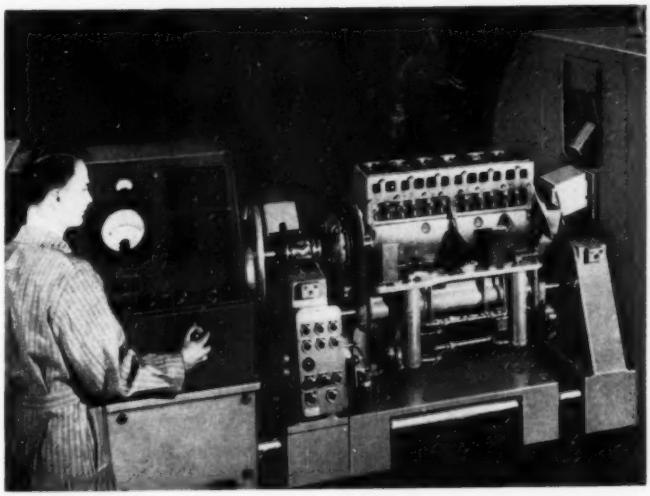
The impact of a higher minimum wage will be felt by employers in the metalworking industry in wage increases that might be necessary to maintain historical differentials, rather than in the number of employees, if any, whose wages might have to be raised up to a higher legal minimum.

Differentials May Cause Trouble

This differential may exist within your own plant, where there may be some very low-skilled jobs with low wage rates, or between your plant and another in the same area, possibly across the street. When the low wage earner gets boosted to the minimum, many with wages above the minimum will want to preserve their higher relationship. And if the differential was equitable in the past, it will be difficult to convince employees that it is not equitable in the future. This is one of the hidden punches in a higher minimum wage, the total potency of which not even the Labor Dept. experts will try to estimate.

One provision in the House minimum wage bill should get close scrutiny from metalworking employers because of the opportunity it offers for savings on premium overtime payments. It permits work up to 12 hours in a day and 56 hours in a week—without compulsory time and a half overtime—if the company has a guaranteed annual wage contract with a certified labor union which assures an average of 40 hours' work for 52 weeks, or a total of 2,080 hours for the year.

While the present law contains a similar provision, the House bill liberalizes it to permit work beyond the 2,080 hours, up to 2,240 hours, without requiring overtime pay for overtime hours worked within the 2,080 hours. Overtime would only be paid on the overtime hours in excess of the 2,080. However, if the employee worked in excess of 2,240 hours during the year, then the employer would have to go back and pay overtime for all overtime hours worked during the year, just as if he did not have an annual wage plan.



***ENGINE BALANCE** is achieved with this new machine being used by Hudson Motor Car Co. It balances the rotating and reciprocating parts of an engine while in motion. The equipment weighs ten tons, cost $30,000 to build. As the engine revolves minute vibrations are picked up by a "brain-box," which "tells" the drills where the unbalance is and how deep to drill on both the flywheel and dampener in order to bring the engine into perfect balance.*

Munitions Board to Allocate 25,000 Plants Among Military Services

WASHINGTON—By far the most important segment of the military's long-range industrial mobilization program is the "allocation" of some 25,000 plants among the various military claimants. The allocation plan is now, after less than a year of work by the Munitions Board, about 60 percent complete.

The latest progress report from the Munitions Board shows that 16,450 plants have been tentatively allocated among the military services. By year-end all of the 25,000 plants are expected to have been allocated and their management briefed for specific production in case of war.

To Review Allocation Pacts

The allocation agreements between management and the Munitions Board are reviewed annually by the military so that obsolescence, and the resulting misuse of plant facilities, can be eliminated.

Meanwhile, one of the important gaps in planning for industrial mobilization, the lack of a stockpile of management personnel to run war plants now idle and in standby condition, is being corrected.

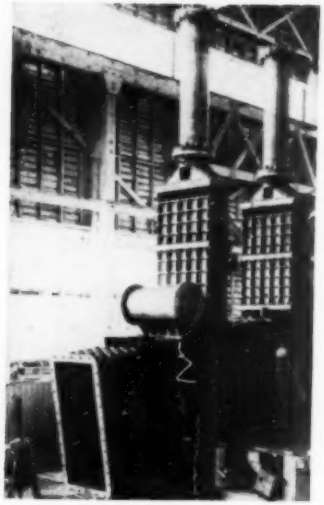
The now famous "phantom contract" idea, applied successfully to machine tool production for the next war, is being applied to the management stockpile problem by the NSRB. Although still in its infancy, the idea is to sign up management personnel who, in a war, would be out of a job because of the "non-essential" label on their present plant or commodity. These people will be given standby contracts to run a war plant should an emergency come along.

Will Use 'Non-Essential' Labor

As NSRB planners express it, "management people can run almost anything," but they have to have someone to carry out their direction. To this end, the manpower section of the Board is studying the availability of personnel for the now-idle war plants. Labor for the war plants obviously will be drawn from the same category of industry as the management group, the "non-essentials."

India Wants Technical Aid For Machine Tool Plant

NEW DELHI, INDIA—The Government of India is negotiating with foreign firms for technical assistance for establishment of a machine tools factory in India. Cost of the factory was estimated at about $20 million and the value of its output in eight years would also be the same.



***SLIDE GATE**, one of 16 hydraulic units built by Westinghouse Electric Corp., Sunnyvale, Cal., for Bull Shoals Dam on White River, northern Arkansas. Each slide gate unit is 47'5" high. Gate leaves will endure pressure of 96 lbs. per sq. in. when lowered.*

$397-Million in ECA Funds For Machinery, Equipment

ECA money for machinery and equipment totaled $397.6-million for the period April 3, 1948 through Feb. 28, 1949. Of this total $41.7-million was for metalworking equipment, $30.7-million for machine tools, and the rest for construction and mining equipment, electrical machinery, engines and turbines, general industrial machinery, agricultural machinery, tractors.

Three biggest buyers under ECA for these commodities are the United Kingdom, France, and Italy with total dollars to date of $72.6-million, $109.5-million, and $75.3-million. Of countries supplying these commodities, the U.S. supplied $380.3-million and Canada, $14.1-million.

By December 31, 1948, only $30.9-million worth of these procurement authorizations had been ordered and shipped. Of this total metalworking machinery shipments valued less than $3-million and machine tool shipments a scant $600,000.

France Needs U.S. Machine Tools

NEW YORK—Immediate and additional help must be given to European industrial machines if the countries there are to meet ECA's 1952 goals, S. Riley Williams, vice president of Worthington Pump & Machinery Corp., Harrison, N. J., told members of the Export Managers Club of New York, March 22.

Speaking at the organization's annual get-together, Mr. Williams cited an example of what he meant: "French industrial production is lagging and handicapped by out-of-date and inadequate machine tool equipment. The total value of these tools runs into hundreds of millions of dollars. Considering the average age and condition of these tools it can be well said that practically the entire equipment should be replaced."

As the annual production of the French machine tool industry is only a fraction of the total installed, he added, and Germany as a source of supply is out of the question, "it will take about five years of French production, plus that which they may import by their own means to merely replace worn out and obsolete equipment."

If France is to recover within any reasonable time, Mr. Williams said, definite aid in the form of a very substantial amount of machine tools and allied equipment is needed to provide essential replacements and additional capacity.

"European recovery depends directly on its production and productivity," he emphasized. "It must be equipped and tooled up to earn more dollars."

The Export Managers Club of New York get-to-gether treated the general topic of "Export Selling—Meeting Today's Challenge," with discussions on industrialization abroad, sales and distribution, foreign credits and collections, ECA accomplishment and outlook, and the Marshall Plan in operation.

Industry May Get Continuous Strip Mill to Roll Magnesium Sheet

NEW YORK — A long-standing dream of the magnesium industry will become a reality if plans materialize for a continuous strip mill to roll magnesium sheet. It has long been said in the industry that a continuous strip mill would bring the price of sheet down enough to greatly increase the consumption, opening new fields of application, and paying off the heavy investment that would be needed.

Even confirmed optimists have been given pause, however, by the cost (perhaps $18 million) and the losses that would be faced while markets were developed.

Research by the Army Engineers Corps and Quartermaster Corps has resulted in enthusiasm for magnesium in arctic operations and for airborne equipment. Widespread use of magnesium sheet in military equipment would make a continuous strip mill highly desirable in event of war. This lends credence to current reports that a mill, to be privately operated, may be built by the government.

Optimism is expected to pervade the annual meeting of the Magnesium Association in Chicago, April 19 and 20. Reports persist that a substantial percentage of automobile hardware may soon be made of chrome-plated magnesium die castings. Recent tests have revived talk of magnesium wheels for automobiles.

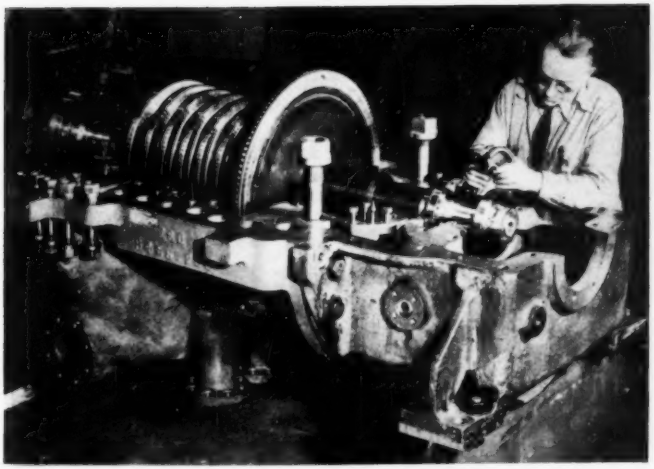
Total magnesium used last year was about 30 million lb. This is about what conservative estimates at the end of the war had indicated. Predictions now are that in another two years the annual rate will be up to 50 million lb.

Metalworking Leads Czech Exports

PRAGUE (McGraw-Hill World News) The metalworking industry is the leading industrial branch in Czechoslovakia's export, accounting for nearly 30% of the total, to a value of some 14 milliard crowns ($280,000,000). Under the Five Year Plan starting this year, it is scheduled to export goods valued at about $375,000,000 by 1953.

Main tasks of the industry are: To accelerate the development of heavy machinery output; to produce enough investment material to insure the expansion of other branches of industry, and of exports; to assure imports of raw material and of investment material by increased exports; to step up production of important categories of consumer goods.

In 1948 the metalworking industry attained the highest peace-time level since 1937. In the Five-Year Plan period this output is to be doubled. The greatest contribution to this increase is to come from the heavy engineering sector, the output of which is to be raised to 246% of the 1948 output by 1953.



***HIGH-SPEED TANKERS** will be powered by these high-pressure turbines under construction at General Electric's Lynn (Mass.) River Works. Here a technician installs the upper half of one of two ball-seated bearings that support the turbine rotor. Operating at 835 psig at 840F, these units, when coupled with a low-pressure turbine and geared to a propeller, will drive the new tankers at a 16-knot cruising speed.*

Russia Cuts Manganese Shipments to Force Relaxing of Machinery Embargo

WASHINGTON—The Russians are going through with their threat to choke off manganese shipments to the U.S.

Last year, manganese imports from the Soviet Union averaged 30-million pounds a month, some 35 percent of all purchases from abroad. In January of 1949, however, our imports from Russia were 17-million pounds. They went down further, to 15-million pounds, in February. And all signs point to a continued decline in March.

For the first quarter as a whole, trade officials look for shipments to drop anywhere from one-half to two-thirds below the like quarter of 1948, when they totalled close to 90-million pounds.

As policymakers in Washington size up the situation, it's an attempt to blackjack us into relaxing our virtual embargo on machinery exports to the Soviet Union. They say the rough stuff won't work.

Shipments are Replaceable

For one thing, Russia's shipments are replaceable—chiefly from the Union of South Africa and the Gold Coast of Africa, but also from India and Brazil. The U.S. imports manganese from all these countries and is going ahead with plans to expand such sources of supply. A few months ago, for example, it made steel available for the construction of ore cars for the Union of South African railways. The cars will transport manganese-bearing ores from mines to tidewater, will result in additional shipments to the U. S.

Then again, U. S. stocks of manganese are large, large enough to keep steel mills going full blast for at least two years.

Can't Get Industrial Equipment

By contrast, the Russians are in a pickle when it comes to getting industrial equipment. They haven't a chance in the U. S., especially if they continue to squeeze us on manganese. And they've pretty much flubbed their chances with the British and the Swedes, who aren't interested in any big machinery-for-food deals while the Soviets hold out for fixed delivery dates plus penalties for defaults.

If the Russians go on reducing their shipments of manganese to this country they'll succeed in at least one thing—cut off a good source of dollar exchange. Their manganese shipments to the U. S. last year brought in approximately $20-million.

That's not all they stand to lose in the way of dollars. Washington officials may decide that two can play at the same kind of game. Right now, they're toying with the idea of swiping back by clamping down on imports of Russian furs.

Janmat Program Nears Completion

WASHINGTON — A summary of weekly reports up to March 4, obtained by AMERICAN MACHINIST at War Assets Administration, shows JANMAT program virtually completed in so far as tagging personal property is concerned.

Very few surplus machine tools wanted by the armed services remain in WAA personal property inventory. During the last week reported, only the New York and Cincinnati regions reported tagging actions—117 and 23 respectively. The other nine regions reported no tags that week.

But a considerable number of machines remaining in surplus plants up for sale or lease, are subject to tagging. James C. Kelley, chairman of the JANMAT control committee, told the writer there is only a sketchy inventory of this equipment, and he was unable to give the rough estimate that has been made.

Still Need Reserve Equipment

Present procedure provides for JANMAT to tag only those items at the real property locations which are determined by WAA to be unrelated or which cannot be sold with the real property. This inventory will comprise only a small portion of the total inventory. WAA hopes to have all JANMAT submissions completed by the end of May.

The JANMAT committee wants to correct erroneous reports that the requirement for reserve equipment is being relaxed, and that machines are freely being released for sale or for lease to industry. The services original goal of 182,000 items is still firm. The misleading reports began to circulate because equipment has been observed being transferred from one storage place to another.

Two Dispositions of Equipment

There are two general dispositions of equipment tagged and shipped to reserve. (1) The services themselves take and store a considerable number of machines at their own facilities. (2) The balance go to the National Industrial Equipment Reserve, for storage by the Public Buildings Administration (of the Federal Works Administration) at its several storage places. The two major accumulations are at Buffalo, New York, and Gary, Indiana.

WAA reports of March 4 indicate 112,895 machines had been tagged; shipping instructions had been received on 112,266 pieces; and 111,635 had been shipped. Six hundred twenty-nine shipping instructions were receivable, and 516 tagged pieces were not yet shipped.

Camera Scenes
from the
17th Annual Meeting
of the
American Society
of
Tool Engineers
Pittsburgh, March 10-12

NEWLY ELECTED *ASTE President Robert B. Douglas (left), president of Godscroft Industries, Montreal, with Retiring President Irwin F. Holland of Pratt & Whitney.*

NEW FIRST V.P. *Herbert L. Tigges (left), exec. v.p. of Baker Bros., with ASTE Director Robert W. Ford of Ex-Cell-O Corp. and Harry E. Conrad, ASTE exec. sec'ty.*

TECHNICAL SESSION *Speakers George A. Roberts, chief metallurgist, Vanadium-Alloys Steel Co., and Malcolm F. Judkins, chief engineer, Carbide Div., Firth-Sterling Steel & Carbide Corp., with John H. Thomas, manager of Pittsburgh Mfg. & Repair of Westinghouse Electric Corp., who was ASTE chairman of meetings and arrangements.*

PAST PRESIDENTS *Frank W. Curtis (left), Robert M. Lippard of the Heald Co., Worcester, Mass., and C. V. Briner of Pipe Machinery Co., Cleveland.*

GUEST SPEAKER *at the annual dinner of the ASTE was Latham E. Osborne, senior operating vice president of Westinghouse Electric Corp., East Pittsburgh, Pa. He spoke on "Tools—Key to abundance."*

Some Good Surplus Plants Are Still Available, War Assets List Reveals

WASHINGTON—If you want a surplus plant don't think that all the good ones have been disposed of. War Assets Administration's latest "Plant Finder" catalog, for April, lists by states well over a hundred plants in detail as to buildings, facilities, and equipment.

The book calls attention to low prices as compared with construction costs and offers attractive credit arrangements. Some of the plants are under government security rights. Purchasers get options to receive war production contracts if the government exercises its take-over rights.

The lists show numerous general manufacturing plants, steel foundries, several aluminum and magnesium works, and sponge iron, steel forging, boiler, coke, aircraft, steam, beryllium plants, and others.

FWA Gets Unwanted Plants

Thirty-four major plants, including 11 aluminum works, are on leases which will expire on various dates from this year to 1967.

Twenty-eight unwanted facilities have been transferred to the custody of Federal Works Administration.

At year-end $1.3 billions of real property remained in inventory, plus $729 million on lease. Only half of the inventory is industrial property. The balance is airports, miscellaneous, and moveable equipment.

Important Plant Sales Listed

WAA's fourth quarter report shows such important plant sales during 1948 as:

Ford Motor Company, at Ypsilanti, Mich., cost $42.8 million, to Kaiser-Frazer for automobile production.

Higgins Aircraft, Inc., New Orleans, cost $9.8 million, to the Board of Commissioners, for industrial use.

Edward C. Budd, cargo plane plant near Philadelphia, cost $8.9 million, to Budd for rail coaches.

Consolidated Vultee Aircraft, New Orleans, cost $8.3 million, to American Radiator.

WAA Extended to July 1

WASHINGTON—War Assets Administration has an extension of life to July 1, and is awaiting an appropriation. The House has voted $12.5 million, which WAA hopes the Senate will raise to $13.75 million. Big (and growing) government will require perpetual disposition of surplus property.

A bill pending in Congress would distribute WAA functions in the Federal Works Agency, but the legislation is complicated and may not be handled this session. In which case WAA will get another extension.

The Hoover Commission has recommended a Bureau of Federal Supply (within an Office of General Services) to control buying, restrict inventories, and dispose of such property as cannot be transferred from agency to agency. Hoover shows tremendous losses through badly planned and inefficient procurement and handling. His proposals will be taken seriously.

A recent effort by the President's brain men to devise a surplus disposal program in standby for any future war was given up, because not enough can be known about future materials and conditions to make any such plan reliable.

Newcomer to Powdered Iron Field Promotes Greater Use of Alloys

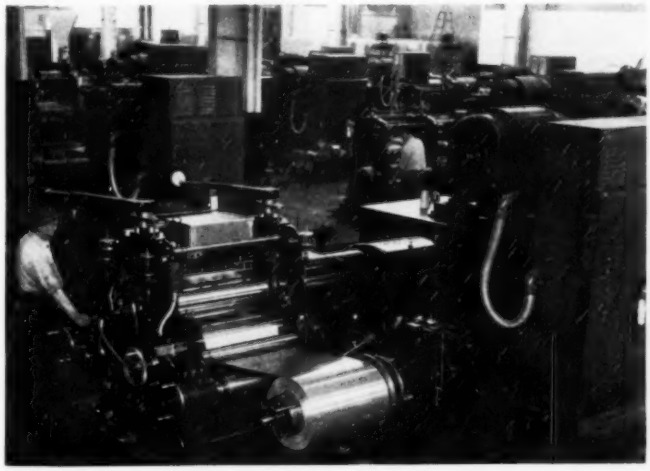
LATROBE, PA.—Ready to make its debut in the field of powdered iron is Vanadium-Alloy Steel Co., using methods different from the conventional and making iron and steel alloys whose price will be close on the heels of that charged for conventional type material of comparable chemical make-up.

Vanadium-Alloy enters the field with prices pared considerably from the 10¢ per lb. of Swedish powdered iron and the domestic product of from 11¢ to 20¢ per lb.

V-A accomplishes a new twist in the powdered metals field by adapting the process covered by Gregory Comstock's patents and licensed through F. W. Burk & Co., Inc., of New York. The basic process has been used by American Brass Co. in turning out powdered copper. The process has been known to the powdered metals industry for several years, but adapting it to the production of powdered iron or steel was the stumbling block.

Products made from iron and steel alloys, while not having the strength as those made from conventional type material, will have little or no waste of metal during the manufacturing process. Forging or casting, and machining can be eliminated or drastically reduced because of the close tolerances the products can be held to.

In addition, it will permit a wider use of high alloy iron and steel in those products where makers have dodged their use because of the difficulty of machining.



***ALUMINUM FOIL** production started last month at Permanente Metals Corp.'s new San Jose, Calif., foil plant, formerly the Aluminumwerke Tscheulin at Teningen Baden, the first German reparations plant purchased by American industry. The rolling mill in foreground is one of 16 which will contribute to anticipated plant capacity of 500,000 to 750,000 lbs. of foil per month.*

Detroit

VENDORS BEING PRESSURED BY FACTORIES FOR LOWER PRICES
SUPPLIERS CUT INVENTORIES TO LOWEST POSSIBLE SAFE GROUND

What are they talking about these days in the auto parts making business?

The first big topic of conversation is the pressure being put on vendors by the factories for lower prices. Car and truck producers are driving for lower quotations. One factor at play in this situation is that general business has slackened off enough that new would-be vendors are talking to purchasing departments and trying to get some business.

Supplier companies in this latter class want business enough, and are desirous enough of getting into auto supply channels, that they are willing to work on narrow profit margins. In many instances, therefore, automobile companies now have price concessions on their desks which can be used as an argument with the already-established suppliers.

The result has been that many suppliers have been sharpening their pencils and modifying their quotations somewhat. The results to date are not too imposing, and are significant as the possible start of a trend rather than as a full-blooming movement. Here and there some new vendors have been brought into the purchasing department fold as a result of the price competition.

Profit Margins Shortened

Vendors generally can do little beyond shortening their profit margins in the face of the auto company demands. They, of course, are going back to their own material and component sources and passing along the pressure.

The second matter of concern in the vendor group is the state of parts requirements of the auto companies, and the length of time it will continue. Auto companies appear to have been engaged in shortening their inventories since the first of the year, and this has resulted in cutbacks and postponements of releases. This in itself, of course, is a worry to the suppliers, and has resulted in a considerable number of schedule curtailments.

The suppliers, in consequence, are playing their production cards close to their belts. They are manufacturing nearer to actual shipping schedules than they have been. And they wonder whether the auto market will maintain itself after the summer selling push (for whose manufacturing they will shortly be in production). That question being in their minds, they, like the car makers, are cutting back their inventories to the lowest possible safe ground.

Job Applications Normal

A third question, more of curiosity than of concern, is prevalent. Layoffs are at hand in a broad scattering of companies, and men are out of work—yet applications for jobs are not abnormal. One smaller Michigan city, for example, has an industrial payroll of about 2,500 workers. At mid-March, much of this city's industry being of a specialized nature in the doldrums at this time, there were approximately 800 idle. Yet job applications at all plants were no greater than normal. Officials of those companies are wondering whether unemployment compensation has reached a size where idle workers would rather have the time off than find other assignments.

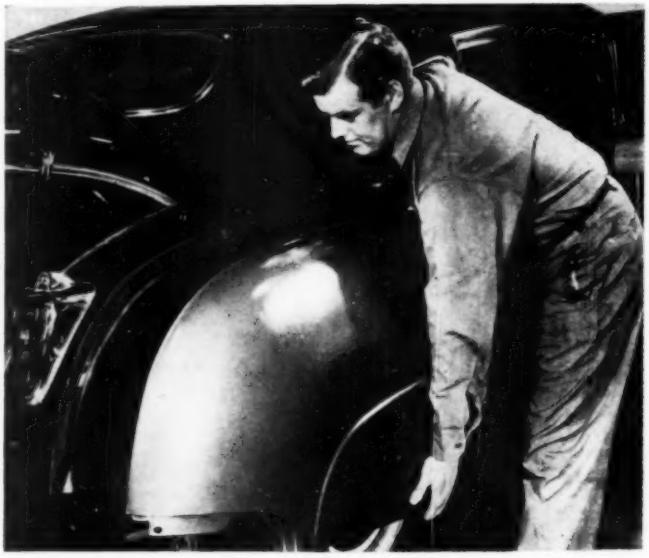
The big auto news of recent weeks was the report—unconfirmed, but solidly grounded—that the Lincoln division of Ford Motor Co. had completed arrangements for use of the Hydra-Matic transmission of General Motors on forthcoming models. The development of a deal of this kind apparently means that lengthy experimental work at the Rouge on automatic transmissions has not panned out successfully up to now.

Spicer Div. of Dana Corp., at Toledo, reportedly is rearranging its facilities to provide Lincoln with components which will accommodate the Hydra-Matic.

Ford to Buy More GM Castings

Purchase of General Motors parts by Ford is nothing new, naturally; practically all companies buy one or two requirements from G.M. parts divisions. The Hydra-Matic deal will be unusual, if actual deliveries begin, only in the size of the piece. Right now, as a matter of fact, Ford is considerably increasing its purchasing of castings from General Motors foundries—largely, the trade gossip goes, because foundry operations at the Rouge are being found to be expensive to the point that they are not competitive.

Willingness of G.M. to negotiate on the Hydra-Matic seems to establish fairly well that Motors, like other companies, has pretty well decided that the direction of automatic transmissions is toward the torque converter type of mechanism, as embodied in the Buick Dynaflow.



***FENDER REPLACEMENT** made easy on the new Hudson, since fenders are actually separate from the body while giving appearance of being a single unit with the body. Replacement takes less time now than on earlier models.*

Names in the News

R. C. Sebold has been named to the newly created post of director of engineering for Consolidated Vultee Aircraft Corp., San Diego. He was formerly chief engineer of the Fort Worth Div. He will be succeeded in that position by **J. W. Larson.**

Bradley C. Higgins has been elected vice president and purchasing agent of Livingstone Engineering Co., Worcester, Mass.

Arthur L. Bradley, chief engineer of Wettlaufer Mfg. Co., Detroit, has been elected president of the American Society of Body Engineers. Other officers: **Carl W. Cenzer,** Hudson Motor, vice president; **Harold V. Atnip,** Chrysler Corp., secretary; **William K. Norwick,** Fisher Body, treasurer.

S. Floyd Stewart has been elected president of Leece-Neville Co., Cleveland. **Charles S. Cook** was elected a vice president. Mr. Stewart joined the company as a research engineer in 1936 and has been executive vice president since 1946.

Arthur A. Blue has been appointed manager of the Instrument Div. of Thomas A. Edison, Inc., West Orange, N. J., after acting as assistant manager of the division for the past six months. He was formerly with W. W. Slocum & Co., Newark, and previously with Wilson Mechanical Instrument Co.

Paul E. Dillberg

Paul E. Dillberg has been appointed superintendent of the Drill Chuck Div., and **Steven J. Ludwin** has been named superintendent of the Lathe Chuck Div. of The E. Horton & Son Co., Windsor Locks, Conn.

Alfred I. Stuart

Alfred I. Stuart has been appointed head of the Methods Engineering Dept. of the Hyster Co., Portland, Ore. He joins the Hyster Co. following several years with Western Electric Co., the E. I. du Pont de Neymours & Co., Inc., and a consulting industrial engineering organization. He will assume full charge of methods engineering for Hyster's three plants in Portland, Danville and Peoria, Ill.

Alexander L. Feild, associate director of research, Armco Steel Corp., Middletown, Ohio, was given an honorary degree of Doctor of Science by Stevens Institute of Technology, Hoboken, N. J.

C. W. MacNeill has joined the Standard-Thomson Corp., Dayton, and will direct a new chemical and metallurgical laboratory. He was recently with the Fyr-Fyter Co., Dayton.

A. M. Tredwell, Jr., has been appointed assistant to the president and director of personnel of Sharon Steel Corp., Sharon, Pa. **J. D. Newman** has been named assistant vice president.

R. W. Kerr, vice president and manager of the Bingham-Herbrand Co. plant in Fremont, O., has been elected vice president of the Billings & Spencer Co., Hartford, Conn., following his election as member of the board of directors. Bingham-Herbrand recently acquired Billings & Spencer by the purchase of 114,869 shares of stock. Other directors elected: **L. E. Yunker,** Bingham-Herbrand president; **William J. Mericka** and **E. E. Parson, Jr.**; and **R. J. Ahern,** president of the Billings & Spencer Co.

S. W. Corbin

S. W. Corbin has been appointed assistant manager of the Industrial Divisions of General Electric's Apparatus Dept., Schenectady, N. Y. He is also manager of the Resale Industries Div., a position he assumed in 1943 and will retain along with his new appointment. He served as sales manager of the machinery manufacturers section of the Industrial Dept. from 1937 to 1943.

J. Clarence Kimpel, formerly secretary and treasurer of the C. M. Kemp Mfg. Co., Baltimore, has been elected president and chairman of the board, succeeding the late **Wallace W. Kemp. Edward J. Funk, Jr.** was elected vice president. He will continue in his capacity as chief engineer. **Charles E. Wilbur** was elected secretary and treasurer. **Wilfred G. Keir** was added to the board of directors.

Leo P. Gajda

Leo P. Gajda has been named director of engineering of Snyder Tool & Engineering Co., Detroit. He was formerly chief draftsman, in which position he has been succeeded by **Elwood M. Keifer.**

J. P. Vederko

J. P. Vederko has been appointed works manager of The Hydraulic Press Mfg. Co., Mt. Gilead, Ohio, succeeding **E. J. McSweeny,** formerly vice president in charge of manufacturing, who resigned Feb. 12. Mr. Vederko will be in charge of all of H-P-M's manufacturing operations.

Walter F. Benning has been appointed chief engineer of Willys-Overland Motors, Toledo, and **Philip C. Johnson** has been appointed assistant chief engineer.

William F. Stewart has been appointed vice president and general manager of the Fitzsimmons Steel Co., Youngstown, O., a subsidiary of American Steel & Pump Corp. **William A. Lampe** has been named vice president in charge of sales.

Frank L. DeCavitte

Frank L. DeCavitte has been named factory manager of the Plymouth Motor Corp. plant at Detroit, after four years as plant manager of the Chrysler Corp. Evansville, Ind., plant. **George H. Rumford, Jr.,** superintendent of the Evansville plant, has been named plant manager.

O. T. Henkle has been elected president of the Mercury Mfg. Co., Chicago, to fill the vacancy caused by the recent death of **Arthur G. Leonard.** Co-founder more than 35 years ago, Mr. Henkle has held the position of secretary and treasurer of the company for many years.

Norman F. Tisdale, chief metallurgical engineer of Molybdenum Corp. of America, Pittsburgh, has been named manager of sales.

A. D. Hardenbrook has been appointed manager of the distribution dept., Ford Div., Ford Motor Co., Dearborn, Mich., succeeding **L. V. Brown,** who recently retired after 37 years with Ford.

P. A. Thompson has been named product supervisor for heat transfer equipment, A. O. Smith Corp., Milwaukee. He was with the Alco Products Div. of American Locomotive Co. for 18 years.

Edward D. Wiard has been appointed sales engineer to represent Illinois Tool Works, Chicago, in the Detroit territory.

BUSINESS ITEMS

American Machine & Foundry Co., New York, has acquired the Transducer Corp., a research and engineering company located in Boston. The firm has also added to its tobacco machinery line the 4-19 Stemmer-Separator, a machine that not only separates the stems from the tobacco leaf but also removes the dust and sand.

Accurate Bushing Co., Garwood, N. J., has expanded its representation over the United States, adding the following firms: The Stanco Co., Inc., Dallas; W. S. Gallagher Co., Buffalo; Iver J. Eberson Co., Denver; Frank A. Hart, Rhinebeck, N. Y.; Formrite Tool Co., South Bend, Ind.

Link-Belt Co., Chicago, has moved its Spokane warehouse and district sales office to larger quarters at North 1303 Washington St., Spokane.

The Wisconsin Carbide Tool Co. has moved its fabricating activities from the Fond du Lac Ave. address to a new plant located at 3343 North 35th St., Milwaukee.

H. B. Salter Mfg. Co., Marysville, Ohio, has repurchased the Glauber Brass Mfg. Co., Kinsman, Ohio, from the Eljer Co., to whom the Glauber firm had been sold in August. The plant will produce the same line of general plumbing fixtures formerly made, and will operate under the name of Glauber Brass Co.

OBITUARIES

Gilbert L. Church

Gilbert L. Church, 69, assistant treasurer of Brown & Sharpe Mfg. Co., Providence, R. I., for more than thirty years, died suddenly at his home Feb. 27. He served also as assistant treasurer of the company's subsidiaries, since 1918 of Brown & Sharpe of New York, Inc., and since 1929 of Brown & Sharpe Co.

Glenn A. Toaz, 64, president of Howe Mfg. Co., Cleveland, makers of machine parts and governors, died Feb. 28, at his home in Bedford, Ohio. He had headed the Howe organization since 1935.

John M. Jerpe, director of the suggestion plan organization for General Motors, died Mar. 10 at Indianapolis, Ind., suffering a heart attack as he was addressing a meeting of the suggestion plan committees from General Motors plants.

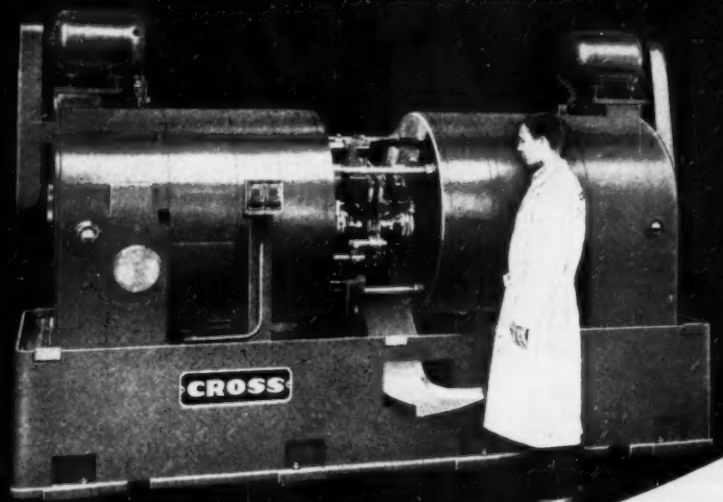
William C. Madsen, branch manager at Gary, Ind., for Reliance Electric & Engineering Co., Cleveland, died March 8 at the Marine Hospital, Cleveland.

C. E. Christensen, 54, vice president and treasurer of the Independent Sheet Metal Corp., Seattle, died March 10. He was chairman of the joint apprenticeship committee of the sheet metal and electrical unions for the active training of young men.

Leland G. Harwood, secretary of The Taylor and Fenn Co., Hartford, Conn., died March 14.

Samuel N. Summer, 64, president of Summer & Co., Columbus, Ohio, and of West Virginia Steel & Mfg. Co., Huntington, W. Va., died Feb. 27.

Another Special by Cross



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American Machinist

REFERENCE BOOK SHEET

Estimating Upset Forgings...III

BY ALBERT P. BERBERICH, Assistant Superintendent, U.S. CLOTH CUTTING MACHINE COMPANY

STOCK			1st PASS		2nd PASS		3rd PASS		STOCK			1st PASS		2nd PASS		3rd PASS	
DIAM.	LENGTH to UPSET	ORIG. VOLUME	UPSET DIAM.	UPSET LENGTH	DIAM.	LENGTH	DIAM.	LENGTH	DIAM.	LENGTH to UPSET	ORIG. VOLUME	UPSET DIAM.	UPSET LENGTH	DIAM.	LENGTH	DIAM.	LENGTH
1 1/4	3 1/8	3.840	1 5/8	1 15/64	2 7/64	1 3/32	2 17/64 3 5/32	31/32 31/64	1 1/2	7 1/2	13.20	1 51/64	4 37/64	2 17/32	2 5/8	3 19/64 3 41/64	1 29/64 1 1/32
"	3 3/4	4.600	"	2 15/64	"	1 9/16	2 17/64 3 5/32	31/32 1 7/32	"	8 1/4	14.60	"	4 7/8	"	"	3 19/64 3 41/64	1 29/64 1 1/32
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"	5 5/8	7.000	"	3 3/8	"	2	2 17/64 3 5/32	1 19/64 1 49/64	"	4 1/16	8.40	"	2 13/32	2 17/64 3 11/64	1 7/16 1 7/16	3 19/64 4 3/4	3 9/16 1 15/32
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"	4 1/8	6.110	"	2 7/16	"	1 29/64	3 1/64 3 13/64	1 13/32 2 9/64	"	8 1/16	18.50	"	5 1/64	2 17/64 3 11/64	3 5/32 2 11/32	3 19/64 4 3/4	3 9/16 1 15/64
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"	8 1/4	12.200	"	4 7/8	"	2 57/64	3 1/64 3 13/64	1 13/64 1 23/32	"	7	16.80	"	4 3/32	2 17/64 3 11/32	2 7/16 1 27/32	3 37/32 5 1/64	1 29/64 49/64
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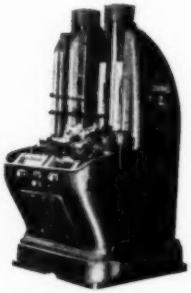
"	4 1/2	7.95	"	2 21/32	"	1 37/64	3 1/64 3 13/64	1 15/16 2 9/64	"	9 5/8	23.20	"	5 41/64	2 17/64 3 11/32	3 11/32 2 29/64	3 37/32 5 1/64	2 31/32
"	5 1/4	9.26	"	3 5/32	"	1 57/64	3 1/64 3 13/64	1 31/64 2 9/64	"	10 1/2	25.20	"	6 19/64	2 17/64 3 11/32	3 21/32 2 41/64	3 37/32 5 1/64	2 3/16 1 7/64
"	6	10.60	"	3 35/64	"	2 3/32	3 1/64 3 13/64	1 1/4 1 29/64	1 7/8	3 3/4	10.40	2 7/16	2 7/32	2 17/64 3 11/32	1 51/64 61/64	4 1/8 5 1/64	29/32 7/16
"	6 3/4	11.90	"	3 51/64	"	2 3/8	3 1/64 3 13/64	1 39/64 1 47/64	"	4 11/16	13.00	"	2 25/32	2 17/64 3 11/32	1 27/32 1 15/64	4 1/8 5 1/64	31/32 29/64

Continuous Type Machine. Made in 4 Sizes.

Surface Broaching

IN THE AUTOMOTIVE FIELD



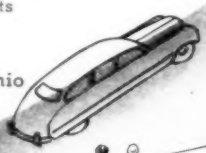
Duplex Surface Broaching Machine. Made in 5, 10, 15 and 25 Ton Sizes.

Surface broaching is being increasingly used to reduce machining costs of duplicate parts that must be made in large quantities to close tolerances. In the automotive field there are many opportunities of applying surface broaching at remarkable savings over present methods. Due to the high production obtained (up to 2000 pieces per hour on many parts) direct labor costs are kept low, and because surface broaching cutting speeds are low (about 30 to 35 feet per minute) tool maintenance costs are kept at a minimum. ● It will pay you to investigate Footburt Surface Broaching methods. Send us blueprints and information on production requirements.

Single Slide Surface Broaching Machine. Made in 5, 10, 15 and 25 Ton Sizes.

THE FOOTE-BURTE COMPANY • Cleveland 8, Ohio

Detroit Office: General Motors Building



INVESTIGATE *Surface Broaching* FOR DIFFICULT MACHINING WORK

FOOTBURT SURFACE BROACHING

A TIME TESTED LINE OF MACHINE TOOLS

Estimating Upset Forgings . . . IV

STOCK			1st PASS		2nd PASS		3rd PASS	
DIAM.	LENGTH to UPSET	ORIG. VOLUME	UPSET DIAM.	UPSET LENGTH	UPSET DIAM.	UPSET LENGTH	UPSET DIAM.	UPSET LENGTH
1 7/8	5 3/8	15.60	2 3/16	3 11/32	3 11/64 3 21/32	1 63/64 1 31/64	4 3/8 5 31/64	1 11/64 21/32
"	6 9/16	18.10	"	3 7/8	3 11/64 3 21/32	2 19/64 1 23/32	4 3/8 5 31/64	1 11/32 49/64
"	7 1/2	20.70	"	4 7/16	3 11/64 3 21/32	2 5/8 1 23/32	4 3/8 5 31/64	1 35/64 7/8
"	8 7/16	23.30	"	4 63/64	3 11/64 3 21/32	2 61/64 2 1/32	4 3/8 5 31/64	1 47/64 63/64
"	9 3/8	25.90	"	5 35/64	3 11/64 3 21/32	3 9/32 2 23/64	4 3/8 5 31/64	1 15/16 1 5/32
"	10 5/16	28.50	"	6 3/32	3 11/64 3 21/32	3 35/64 2 45/64	4 3/8 5 31/64	2 1/8 1 13/64
"	11 1/4	31.10	"	6 21/32	3 11/64 3 21/32	3 15/16 2 61/64	4 3/8 5 31/64	2 23/64 1 5/16
2	4	12.60	"	2 3/8	3 3/8 3 29/32	1 15/32 1 1/16	4 25/64 5 27/32	5/64 15/32
"	6	18.80	"	3 35/64	3 3/8 3 29/32	2 3/32 1 51/64	4 25/64 5 27/32	1 15/64 45/64
"	8	25.10	2 13/32	4 47/64	3 3/8 3 29/32	2 51/64 2 3/32	4 25/64 5 27/32	1 33/32 15/16
"	9	28.20	"	5 11/32	3 3/8 3 29/32	3 9/64 2 11/32	4 25/64 5 27/32	1 45/64 1 7/64
"	10	31.40	"	5 59/64	3 3/8 3 29/32	3 1/2 2 5/8	4 25/64 5 27/32	2 7/64 1 11/64
"	11	34.60	"	6 37/64	3 3/8 3 29/32	3 45/64 2 7/8	4 25/64 5 27/32	2 3/32 1 15/64
"	12	37.70	"	7 3/32	3 3/8 3 29/32	4 13/64 3 5/32	4 28/64 5 27/32	2 31/64 1 13/32
"	13	40.80	"	7 3/4	3 3/8 3 29/32	4 39/64 3 13/32	4 25/64 5 27/32	2 49/64 1 17/32
"	14	44.00	"	8 13/64	3 3/8 3 29/32	4 23/32 3 45/64	4 28/64 5 27/32	2 29/32 1 41/64
2 1/4	4 1/2	17.90	2 29/64	2 43/64	3 81/64 4 25/64	1 87/64 1 5/16	4 15/16 6 19/32	15/16 17/32
"	6 3/4	26.90	"	4 1/64	3 81/64 4 25/64	2 3/8 1 25/32	4 15/16 6 19/32	1 13/32 49/64
"	9	35.80	"	5 11/32	3 81/64 4 25/64	3 5/32 2 23/64	4 15/16 6 19/32	1 7/16 1 5/64
"	10 3/8	40.30	"	6 1/64	3 81/64 4 25/64	3 5/16 2 31/32	4 15/16 6 19/32	2 7/64 1 31/64
"	11 1/4	44.80	"	6 45/64	3 81/64 4 25/64	3 15/16 2 55/64	4 15/16 6 19/32	2 15/64 1 5/16
"	12 3/8	49.10	"	7 11/32	3 81/64 4 25/64	4 7/16 3 7/32	4 15/16 6 19/32	2 5/16 1 7/16
"	13 1/2	53.80	"	8 3/64	3 81/64 4 25/64	4 47/64 3 5/16	4 15/16 6 19/32	2 13/16 1 37/64

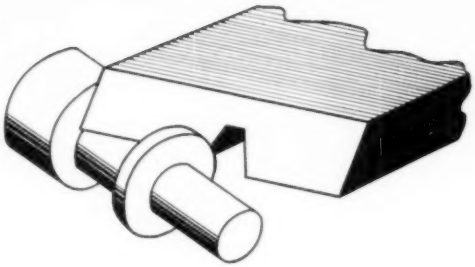
STOCK			1st PASS		2nd PASS		3rd PASS	
DIAM.	LENGTH to UPSET	ORIG. VOLUME	UPSET DIAM.	UPSET LENGTH	UPSET DIAM.	UPSET LENGTH	UPSET DIAM.	UPSET LENGTH
2 1/4	14 5/8	58.20	2 33/64	8 43/64	3 81/64 4 25/64	5 9/64 3 49/64	4 15/16 6 19/32	3 3/64 1 45/64
"	15 3/4	62.70	"	9 23/64	3 81/64 4 25/64	5 33/64 4 3/32	4 15/16 6 19/32	3 5/32 1 27/32
2 1/2	5	24.60	3 1/4	2 31/32	4 15/64 4 7/8	1 3/4 1 5/16	5 1/2 7 5/16	1 1/32 35/64
"	7 1/2	36.80	"	4 7/16	4 15/64 4 7/8	2 5/8 1 31/32	5 1/2 7 5/16	1 33/64 7/8
"	10	49.10	"	5 15/16	4 15/64 4 7/8	3 1/2 2 5/8	5 1/2 7 5/16	2 1/16 1 1/64
"	11 1/4	55.10	"	6 21/32	4 15/64 4 7/8	3 31/64 2 13/16	5 1/2 7 5/16	2 5/16 1 5/16
"	12 1/2	61.40	"	7 13/32	4 15/64 4 7/8	4 3/8 3 3/32	5 1/2 7 5/16	2 31/64 1 23/64
"	13 3/4	67.50	"	8 5/32	4 15/64 4 7/8	4 31/64 3 33/64	5 1/2 7 5/16	2 27/32 1 19/64
"	15	73.70	"	8 29/32	4 15/64 4 7/8	5 1/4 3 15/16	5 1/2 7 5/16	3 3/32 1 3/4
"	16 1/4	79.80	"	9 7/32	4 15/64 4 7/8	5 11/16 4 1/64	5 1/2 7 5/16	3 35/64 1 23/32
"	17 1/2	86.00	"	10 3/8	4 15/64 4 7/8	6 1/8 4 1/32	5 1/2 7 5/16	3 5/8 2 7/64
2 3/4	5 1/2	32.60	3 5/16	3 13/64	4 41/64 5 23/64	1 13/16 1 5/16	6 3/64 8 3/64	1 5/64 47/64
"	8 1/4	48.90	"	4 57/64	4 41/64 5 23/64	2 23/32 2 1/32	6 3/64 8 3/64	1 47/64 31/32
"	11	65.4	"	6 21/32	4 41/64 5 23/64	3 7/8 2 39/64	6 3/64 8 3/64	2 3/32 1 15/64
"	13 3/4	81.6	"	8 5/32	4 41/64 5 23/64	4 57/32 3 5/8	6 3/64 8 3/64	2 35/64 1 19/64
"	16 1/2	97.9	"	9 31/64	4 41/64 5 23/64	5 47/64 4 11/32	6 3/64 8 3/64	3 11/32 1 15/16
"	17 7/8	106.0	"	10 21/32	4 41/64 5 23/64	6 9/32 4 11/16	6 3/64 8 3/64	3 31/64 2 5/64
"	19 1/4	114.0	"	11 13/32	4 41/64 5 23/64	6 3/4 5 3/64	6 3/64 8 3/64	3 5/64 2 3/4
"	20 5/8	122.0	"	12 13/64	4 41/64 5 23/64	7 15/64 5 13/32	6 3/64 8 3/64	4 3/4 2 25/64
"	22	131.0	"	13 3/32	4 41/64 5 23/64	7 47/64 5 57/64	6 3/64 8 3/64	4 37/64 2 27/64
3	6	42.40	3 33/32	3 35/64	5 1/16 5 21/32	2 3/32 1 47/64	6 19/32 8 25/32	1 15/64 49/64
"	9	63.5	"	5 5/16	5 1/16 5 21/32	3 1/8 2 23/64	6 19/32 8 25/32	1 55/64 1 3/64
"	12	84.7	"	7 3/32	5 1/16 5 21/32	4 33/64 3 5/32	6 19/32 8 25/32	2 31/64 1 13/32

Tips on Shave and Skive tools ...by Stainless Sam

1

Stainless Sam recommends the shave tool for fine finish and close tolerance work on multiple spindle equipment. Entire length of the cutting edge is in contact with the work piece during the cutting action. Cutting pressures are high but it can be used with a short stroke.

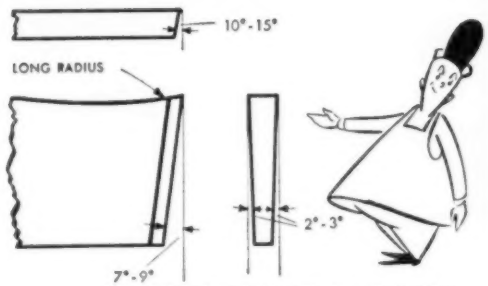
Here Stainless Sam illustrates a combination shave and cut-off tool used on the back of the cross slide of a turret lathe. Made for a specific job, it permits limited adjustment of the shave tool.



2

For the production of close-tolerance, intricate shapes of Stainless Steel, skive tools may be used on single spindle automatics or turret lathes. A skive or sheer angle of 5° to 15° is employed; the cutting edge should be ground with a clearance of 1° to 2°, and a front rake angle of 10° to 15°.

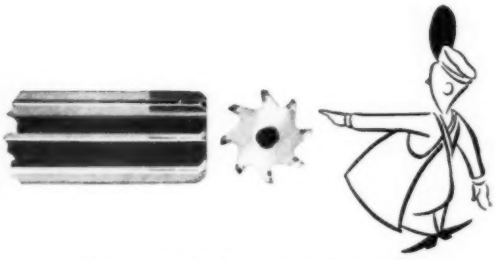
Because of the skive angle the tool may require a considerable amount of stroke. This may limit its application. In contrast, the shave tool (No. 1) has a straight cutting edge, permitting a short stroke.



3

For cut-off work on Stainless Steels, tools should be made of high-speed steel, one of the cobalt tool steels, cast alloys or carbides. If a high finish is required follow with a facing tool or grinding.

A cutting angle of 10° to 15° facilitates chip removal and is suitable for small work. On larger parts this angle can be reduced to 5°. Clearance is provided by the 2° to 3° angle indicated. A front rake angle of 7° to 9° is recommended.



4

When reaming Stainless, the best finish is usually obtained with a carbide tipped reamer, operating at a speed of 100 to 300 SFM. Stainless Sam recommends narrow lands and a secondary lead angle.

A smooth finish can be obtained with a high speed steel reamer at 15 to 40 SFM. The reaming operation should be flooded with sulfurized oil. Use water soluble oil for carbide tipped reamers operating at high cutting rates.

If you are not using ARMCO Stainless Steel bars or wire, perhaps parts of your equipment or products could benefit by these rustless metals—often at ***little or no increase*** in finished part costs. ARMCO Stainless resists heat and corrosion, adds strength and beauty to the products you make.

For complete up-to-the-minute shop information, write for a copy of the ARMCO booklet, "Machining of ARMCO Stainless Steels."

And remember, ARMCO Stainless bars, wire and angles are available for quick delivery. Just write Armco Steel Corporation, 202 Curtis Street, Middletown, Ohio.

Export: The Armco International Corporation

ARMCO
STAINLESS STEELS

ARMCO

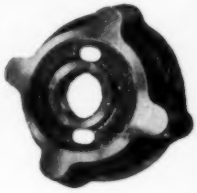
Estimating Upset Forgings...V

STOCK			1st PASS		2nd PASS		3rd PASS		STOCK			1st PASS		2nd PASS		3rd PASS	
DIAM.	LENGTH to UPSET	ORIG. VOLUME	UPSET DIAM.	UPSET LENGTH	UPSET DIAM.	UPSET LENGTH	UPSET DIAM.	UPSET LENGTH	DIAM.	LENGTH to UPSET	ORIG. VOLUME	UPSET DIAM.	UPSET LENGTH	UPSET DIAM.	UPSET LENGTH	UPSET DIAM.	UPSET LENGTH
3	15	106.0	3 17/32	8 7/8	5 1/16 5 5/32	5 1/4 3 15/16	6 1/32 8 5/32	3 7/64 1 3/4	3 1/2	28	270.0	4 15/64	16 19/32	5 5/32 6 5/16	9 27/32 7 3/8	7 49/64 10 15/64	5 11/64 3 15/16
"	18	127.0	"	10 5/8	5 1/16 5 5/32	6 11/64 4 27/32	6 1/32 8 5/32	3 9/32 2 3/32	"	31 1/2	303.0	"	18 1/64	5 5/32 6 5/16	11 1/64 8 7/32	7 49/64 10 15/64	6 1/2 3 45/64
"	19 1/2	138.0	"	11 1/2	5 1/16 5 5/32	6 7/8 5 1/4	6 1/32 8 5/32	4 5/64 2 5/64	"	35	337.0	"	20 3/4	5 5/32 6 5/16	12 7/32 9 7/64	7 49/64 10 15/64	7 5/64 4 13/64
"	21	148.0	"	12 1/32	5 1/16 5 5/32	7 7/64 5 1/2	6 1/32 8 5/32	4 5/16 2 5/16	3 3/4	7 1/2	83.0	4 7/8	4 7/64	6 1/32 7 5/16	2 1/64 1 7/32	8 1/4 11	1 3/64 7/8
"	22 1/2	159.0	"	13 1/64	5 1/16 5 5/32	7 25/32 6 7/64	6 1/32 8 5/32	4 9/32 2 5/8	"	11 1/4	124.0	"	6 31/32	6 1/32 7 5/16	3 1/16 2 9/64	8 1/4 11	2 5/16 1 7/64
"	24	169.0	"	14 5/32	5 1/16 5 5/32	8 7/64 6 7/64	6 1/32 8 5/32	4 9/64 2 9/64	"	15	166.0	"	8 29/32	6 1/32 7 5/16	5 17/64 3 7/16	8 1/4 11	3 5/16 1 3/4
3 1/4	6 1/2	53.9	4 13/64	3 7/32	5 31/64 6 1/32	2 3/32 1 15/64	7 5/32 9 1/2	1 11/32 4 3/64	"	18 3/4	208.0	"	11 1/8	6 1/32 7 5/16	6 19/32 4 5/64	8 1/4 11	3 37/64 2 7/16
"	9 3/4	80.8	"	5 3/4	5 31/64 6 1/32	3 7/64 2 7/16	7 5/32 9 1/2	2 1/64 1 7/64	"	22 1/2	249.0	"	13 5/16	6 1/32 7 5/16	7 45/64 5 9/64	8 1/4 11	4 7/32 2 5/8
"	13	108.0	"	7 11/64	5 31/64 6 1/32	4 3/16 3 1/16	7 5/32 9 1/2	2 11/16 1 3/64	"	26 1/4	290.0	"	15 7/64	6 1/32 7 5/16	9 13/64 7	8 1/4 11	5 5/64 3 7/64
"	16 1/4	135.0	"	9 5/8	5 31/64 6 1/32	5 5/64 4 7/64	7 5/32 9 1/2	3 5/64 1 11/32	"	30	332.0	"	17 51/64	6 1/32 7 5/16	10 25/64 7 29/32	8 1/4 11	6 13/64 3 11/64
"	19 1/2	162.0	"	11 11/32	5 31/64 6 1/32	6 5/32 5 5/64	7 5/32 9 1/2	4 1/64 2 3/32	"	33 3/4	375.0	"	20	6 1/32 7 5/16	11 13/16 8 5/64	8 1/4 11	6 13/32 3 7/64
"	21 1/8	175.0	"	12 29/64	5 31/64 6 1/32	7 5/16 5 9/16	7 5/32 9 1/2	4 1/32 2 13/32	"	37 1/2	415.0	"	22 15/64	6 1/32 7 5/16	13 3/16 9 5/64	8 1/4 11	7 1/64 4 5/64
"	22 3/4	189.0	"	13 1/64	5 31/64 6 1/32	8 6	7 5/32 9 1/2	4 45/64 2 15/32	4	8	101.0	5 1/64	4 3/4	6 1/32 7 5/16	2 13/16 1 13/32	8 1/4 11	1 5/16 1
"	24 3/8	202.0	"	14 3/8	5 31/64 6 1/32	8 13/32 6 13/32	7 5/32 9 1/2	5 1/64 2 17/32	"	12	151.0	"	7 5/32	6 19/64 7 5/16	4 13/64 3 5/32	8 1/4 11	2 31/64 1 13/32
"	26	216.0	"	15 13/32	5 31/64 6 1/32	9 5/32 6 5/64	7 5/32 9 1/2	5 3/8 3 1/64	"	16	201.0	"	9 1/2	6 29/64 7 5/16	5 19/32 4 13/64	8 1/4 11	3 13/64 1 7/8
3 1/2	7	67.4	4 5/32 4 25/64	4 5/32	5 39/64 6 7/16	2 29/64 1 25/32	7 5/16 10 7/64	1 29/64 4 5/64	"	20	251.0	"	11 13/64	6 1/4 7 5/64	7 5 1/4	8 1/4 11	4 1/16 2 23/64
"	10 1/2	101.0	"	6 13/64	5 37/64 6 7/16	3 11/16 2 49/64	7 5/16 10 7/64	2 1/64 1 5/64	"	24	302.0	"	14 19/64	6 9/64 7 5/64	8 13/32 6 3/16	8 1/4 11	4 61/64 2 13/16
"	14	135.0	"	8 15/64	5 37/64 6 7/16	4 29/32 3 11/16	7 5/16 10 7/64	2 29/32 1 9/32	"	28	352.0	"	16 7/64	6 9/64 7 5/64	9 31/64 7 1/64	8 1/4 11	5 25/32 3 7/64
"	17 1/2	168.0	"	10 1/64	5 37/64 6 7/16	6 7/64 4 13/32	7 5/16 10 7/64	3 3/64 2 1/16	"	32	402.0	"	18 7/32	6 9/64 7 5/64	11 1/64 8 13/32	8 1/4 11	6 13/32 3 7/64
"	21	202.0	"	12 7/64	5 37/64 6 7/16	7 9/64 5 3/64	7 5/16 10 7/64	4 3/64 2 13/32	"	36	453.0	"	21 1/64	6 9/64 7 5/64	12 5/32 9 1/64	8 1/4 11	7 9/64 4 13/64
"	24 1/2	236.0	"	14 3/64	5 37/64 6 7/16	8 13/32 6 29/64	7 5/16 10 7/64	5 1/16 2 57/64	"	40	503.0	"	23 7/32	6 9/64 7 5/64	14 10 23/64	8 1/4 11	8 1/4 4 43/64

How to bore, turn and face it faster?

Put it on a NEW BRITAIN

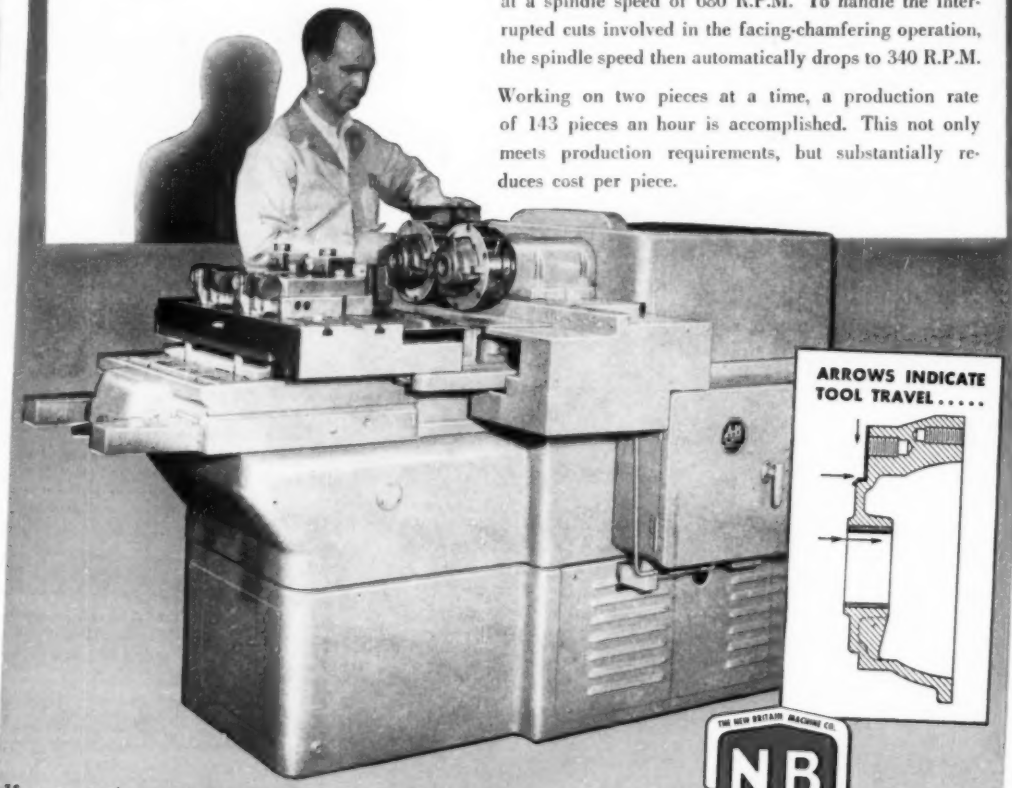
Precision Contour Turning and Boring Machine



Separate boring and facing operations on this automotive assembly were taking too much time. Looking for a way to get more pieces per hour, the manufacturer investigated every possibility and found a New Britain Model 37 to be the answer.

It first bores the I.D. of the shaft hole to ±.0005 tolerance and turns the O.D. of the shoulder to ±.0007 at a spindle speed of 680 R.P.M. To handle the interrupted cuts involved in the facing-chamfering operation, the spindle speed then automatically drops to 340 R.P.M.

Working on two pieces at a time, a production rate of 143 pieces an hour is accomplished. This not only meets production requirements, but substantially reduces cost per piece.



If your work involves any precision, contour or straight, boring and turning operations . . . look into these New Britain high production units.

If you would like to see other actual cost histories, write for the folder *"It Can Be Done."*

449HF1

NB

NEW BRITAIN

Automatics

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN-GRIDLEY MACHINE DIVISION
NEW BRITAIN, CONNECTICUT

TALKING SHOP

Air Stop

ONE BRAKE BUILDER says a major problem is to get 100 stops out of a set of aircraft brake linings. Jet-propelled jobs have no reversible props like big transports and bombers, so troubles are multiplied there. For example, thermocouples in a 12x3-in. brake drum indicate that in an 11-sec. service stop, drum temperature tops 1000 F. Steel-banded cast-iron faced drums are required; cast-iron alone would crack and burst because of rapid temperature rise.

Boys Will Be Boys

CHESTER RICKER'S latest Detroit story deals with the G. M. executive who finally had his new—and very expensive—Cadillac delivered. He couldn't wait until he took his first ride. As he rounded the first fast corner there was a rumble—a rumble which was repeated at every fast corner. So he had the service men at the plant go over it. They checked it out as perfect—but he found the rumble still there.

Then the heat went on. The servicemen finally decided the rumble was in a rear door. When they tore it down, they found inside a coke bottle, hanging on a string. And inside the bottle was this printed note: "Well, I wondered how long it would take you to find this."

Hot Chips

ONE TOOL BUILDER FRIEND says there is as much to be gained from proper selection and use of cutting fluid as was gained by application of carbides. The problem seemingly is to achieve a paradox—cooling the tool but not the chip—and seems to have been created by the recent increases in speed . . . As a case in point, one machine-tool builder spent a worried three days just before the Machine Tool Show; he couldn't keep the tools in one production machine sharp long enough to demonstrate it. A change in cutting fluid did the trick—and he ran through the Show, changing tools only once a day.

Circular Precision

REMEMBER our recent remarks about accuracy in circular measurements? Lew Suverkrop of Suverkrop Instruments, Bakersfield, Calif., writes in to say our figures on the radius at which 0.001 in. subtends a second of arc (206 in., plus) are quite correct. He adds that an easy—and easily rememberable—way to figure such things is to use the tangent relationship. The tangent of a 1-sec. angle is 0.000004848, correct to the ninth decimal place, or "five noughts five," which is *very* easy to remember and correct to the sixth decimal place.

He points out further that the implied concentricity in the initial gear of the Suverkrop Transit (Fellows Gear ad, *A.M.*, Jan. 4, 1945) is estimated at plus or minus 0.000033 in., based on accuracy to ¾ min. of arc.

Paintronics

ABOUT 30 automotive and supplier firms are now electrostically spray-painting body parts, headlamps, horns, rubber floor mats and similar parts. Many installations also have "electric eye" control.

Daffynitions

FILING SYSTEM: method of misplacing things systematically . . . BUDGET: method of planning worrying . . . INCOME-TAX FORMS: blankety-blanks . . . DIME: chip off the old buck . . . BACHELOR: man who never Mrs. . . . UNDERHANDED GAME: horseshoes . . . POST-WAR LETDOWN: women's skirts . . . TODAY'S GREATEST LABOR SAVER: tomorrow . . . CURE FOR SALARY CUT: a dose of sweat . . . ADVICE: what an intelligent man seldom needs and an unintelligent man can't use.

Wire Pallets

FOLDING STEEL-WIRE PALLETS are booming, because they cut handling and double box-car capacity. One user reports handling loads up to 1½ tons, stacking six high in the plant, two high for shipping, with much reduced dunnage . . . Another reports buying batteries at 5 cents less when palletized, no damage in transit and 90% reduced handling as compared with crated batteries . . . Chester Ricker, Detroit editor, described wire pallets in our "Practical Ideas" section some months ago, received 20 or more letters.

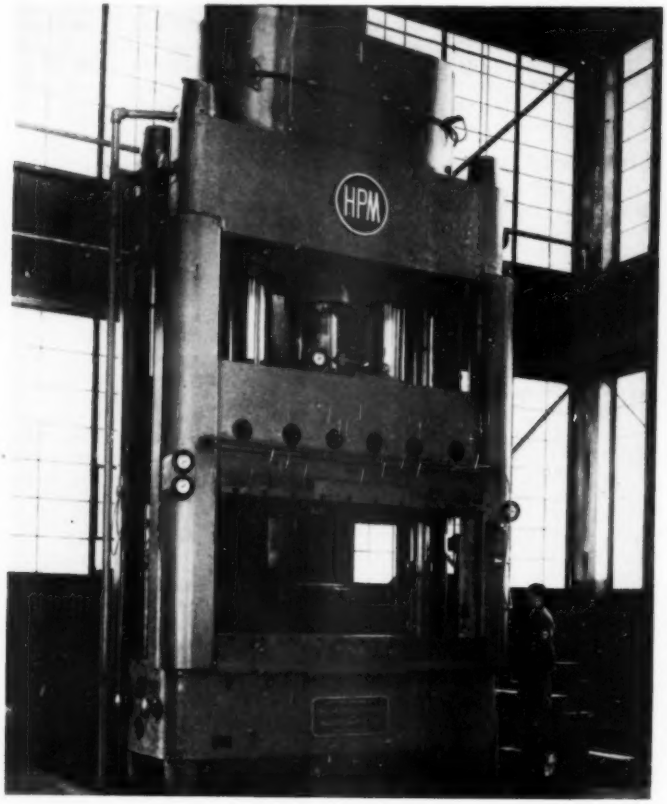
Flammable Fluid?

AT THE SAE meeting in Detroit, one speaker discusseed hydraulic fluids for aircraft—and the importance of being sure they're non-toxic when burned. He found one fluid broke down into chlorine and phosgene, another produced a trichlorphosphate end product almost as toxic as these two gases . . . Point is, be careful in your selection of hydraulic fluids for use in a die-casting machine or other application where heat may cause fluid breakdown.

Sore Feet

EMPLOYEES with sore feet cost their bosses $100 million last year. To find relief from aching corns and bunions, they are inclined to throw themselves off balance, thus suffering more injuries and damaging or breaking whatever they're handling. Besides, sore feet cause irritability and trouble with adjacent workers and customers. A recent report shows 16% of all industrial workers lose a day's work a month because their feet hurt . . . To combat this, more and more companies are providing podiatric care. Kaiser, Jack & Heintz and Murray Mfg. have been doing it for some time. Others are providing rubber pads for workers who stand before a machine all day, and checking employees regularly who use their feet extensively.

Shop Equipment News



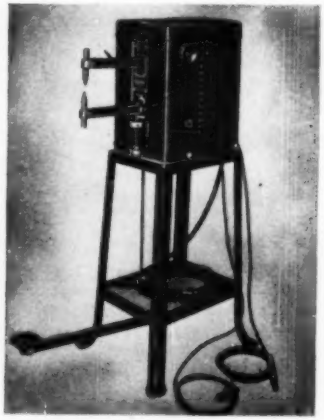
HPM Sheet-Metal Drawing Press Handles Large-Dimension Work

The Hydraulic Press Mfg. Co., Mount Gilead, Ohio

The Fastraverse sheet-metal drawing press with a pressure capacity of 1000 or 500 tons is designed to handle deep draw jobs of exceptionally large dimensions. The press has a platen of 120x72x 70-in. daylight opening and 36-in. ram travel, and is equipped with a 300-ton HPM hydraulic die cushion with a platen of 48x52 in., and a 24-in. stroke.

The press is equipped with three main rams for the multiple-press-ram system of operation in two ranges of pressing speed. For a fast preliminary pressing at medium pressure, either the central main ram or the two outer rams can be employed wtih a 500-ton pressure. At a predetermined position, all three rams can be used to develop the high pressure required for final forming.

Also incorporated is the HPM closed-circuit Fastraverse system of operation, which regulates both the speed and direction of every press ram movement through control of the output of the pressure-generating radial pump.



Dual-Weld Combination Welder Spot Welds, Arc Welds, Solders

Delta Manufacturing Div., Rockwell Mfg. Co., 600 E. Vienna Ave., Milwaukee 1, Wis.

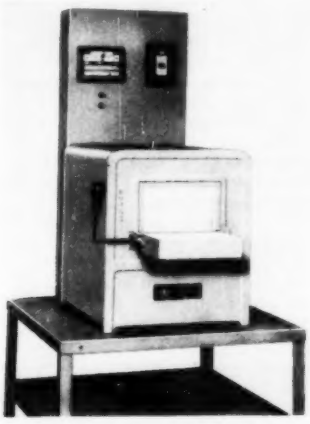
Three welders, a Dual-Weld combination spot and arc welder, the 5-kva. spot welder, and the portable 120-amp. arc welder are offered. The Delta-Milwaukee "Dual-Weld" combination welder takes less than half the floor space needed by the average 5-kva. spot welder plus the average 120-amp. arc welder. Dimensions are: 14x19¾x26⅝ in.

The Dual-Weld unit spot welds, arc welds, solders and brazes. Its 10-in. throat depth permits spot welding to the center of a 20-in. sheet. A lever permits simple change-over from arc welding to spot welding. The one-piece welding horns of a solid high-strength copper-alloy casting eliminate inefficient electrical joints and provides maximum current for spot-welding. The wound transformer core for low watt-loss is also featured. Important for non-ferrous and light jobs is the fact that full spot-weld pressure adjustment gives infinite control from minimum to maximum pressure.

The 5-kva. spot welder is designed for manufacturing plants, light fabrication industries, sheet-metal contractors and other shops and places where proper current

is available. The welder delivers a maximum of 7000 amp. and operates on 230-v., single-phase 50/60 cycle ac. and will weld at a production rate of 2 pieces, 16-gage clean mild steel. Operated on a reduced voltage of 115 v., the spot welder's output reduces sufficiently to make possible the welding together of extremely fine wires without overheating or burning. The spot welder can be converted to an automatic high-production spot welder by adding air equipment and a weld timer.

Also introduced is a portable arc welder rated at 120 amp. at 25 load volts. It is a light-duty limited-input transformer-type welder. Electrodes recommended for this arc welder range from 1/16 to 1/8 in. in diameter.



Cooley Laboratory Muffle Furnaces Cover Range from 300 to 2000 F.

Cooley Electric Mfg. Corp., 38 S. Shelby St., Indianapolis 7, Ind.

A line of laboratory muffle furnaces with integral selective power modifiers is designed for a complete temperature range from 300 to 2000 F. Furnaces can be used for physical, chemical and industrial laboratory use for experimental testing, enameling, fusing, igniting, and other uses.

The line of furnaces is further augmented by the Cooley Model ACL and ACH recirculating air-draw furnaces with built-in selective power modifier for temperatures to 900 F. and 1200 F.

The model MM furnaces are offered in 5 models operating at maximum temperatures of 1750 to 2000 F. with inside dimensions varying from 4x3x8 in. to 10x6x18 in.

Medium-Capacity Cutter, Tool Grinder Offers Head Swivelling Through 180°

Gallmeyer & Livingston Co., Grand Rapids 2, Mich.

The No. 10 universal cutter and tool grinder is offered as a medium-capacity machine at a moderate price. A handwheel, located at the top of the machine raises and lowers the column and head. Graduated dials reading in thousandths are provided for both vertical and transverse movements.

The head can be swivelled through 180° and locked at desired setting. The table can be swivelled to 90° either side of center to provide desired relation be-

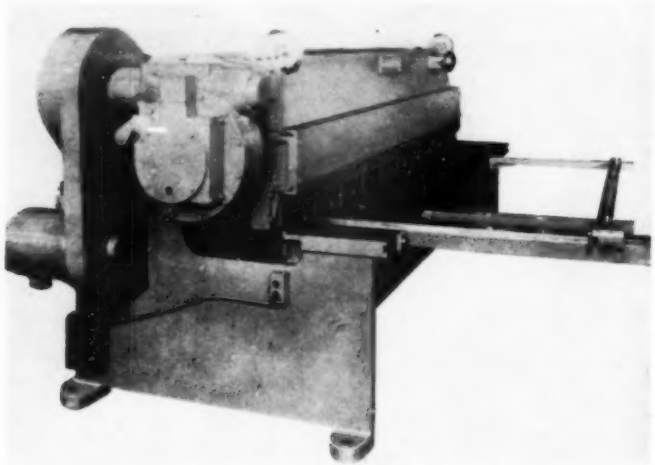
• IN APRIL 21 American Machinist

Injection-molding machine has 48-oz. capacity. This single-shot machine has an automatic stuffing arrangement said to increase rated capacity by 40 to 50%.

High-frequency welder for inert-gas shielded welding has been approved by the Federal Communications Commission. Operating on an assigned frequency, the welder does not interfere with radio and television reception.

Taper comparator checks 800 taper holes per hour to an accuracy of one minute. It uses two contact lines on the taper, compares their distance apart with a master.

tween the table and the grinding-wheel spindle. Two spindle speeds are provided. Table size is 5x30 in. Longitudinal table movement is 16 in. Cross movement of the wheel is 8 in. Vertical movement of spindle is 8 in. The spindle is driven through a V-belt by a ½-hp. ball-bearing motor mounted on the head of the machine.



New Series Steel Squaring Shears Built in Seven Sizes by Columbia

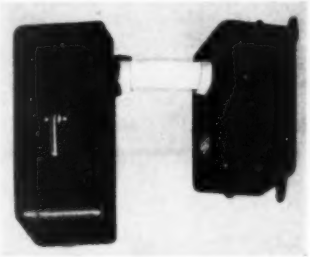
Columbia Machinery and Engineering Corp., Hamilton, Ohio

A new series Columbia steel squaring shears is offered with motor-operated precision back gages, solenoid-operated clutches, controlled by movable foot switches, and low with over-all height. The worm-gear drive offers quiet vibration.

The shaft and worm are machined in one piece from high-alloy chrome-nickel steel, and the worm gear is of special aluminum bronze with a tensile strength of 60,000 psi. The high-carbon, alloy-steel clutch, with six jaws, is bolted to the web of the worm gear and operates on the large squared end of the eccentric shaft.

Automatic hydraulic hold-downs are controlled by a cam to insure positive operation. The motorized back-gage is operated by an individual electric motor and controlled by a pushbutton switch. Adjustment is made through a simplified chain and sprocket drive. A vernier dial indicates the exact setting so that an operator with little experience can set the back gage within 1/128 in.

The steel squaring shears are available in seven sizes for shearing ⅜- to 1¼-in. mild steel in 6- and 10-ft. lengths. Three additional models for high-speed precision shearing of 3/16-in. mild steel, 10 and 12 ft. long, and ¼ in. by 6 ft. incorporate the design features of other new series models, except the motor-driven back-gage and hydraulic hold-downs.



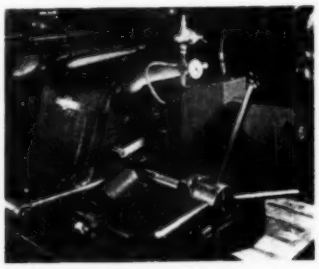
PHOTOELECTRIC SMOKE INDICATOR, Type A20C-1 indicates the density of smoke passing through the flue or breaching of a heating or power plant, and signals when this density approaches the values prescribed by municipal smoke ordinances. It consists of a photoelectric control and light source mounted on opposite sides of the flue. The indicator operates under a 115-v. ac. 60-cycle supply—*Photoswitch, Inc., 77 Broadway, Cambridge 42, Mass.*

Taft-Peirce Power-Gaging Handle Eliminates Manual Gage Rotation

The Taft-Peirce Manufacturing Co., Woonsocket, R.I.

A power-driven gaging handle is introduced for inspection of internally threaded parts. Manual rotation of a gage is eliminated. The gaging handle mechanically screws the gage into and out of the work at a speed of 4 rps. Immediate reversal or automatic disengagement of the drive is obtained by a slight change in the applied pressure.

The power gaging handle is available for any of the following AGD gage blanks: No. 4, 5, 6, 8, 10, 12, ¼ in., 5/16 in., ⅜ in., 7/16 in. and ½ in. It is made for 110 volts ac. only.



Auto-Feed Attachment for Grinder Gives Automatic, Manual Operation

The Bennett Equipment Co., 4725 Ellery, Detroit 7, Mich.

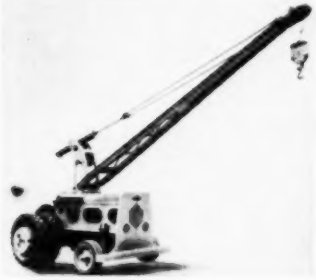
The auto-feed attachment is designed for use on the No. 2 Cincinnati centerless grinder, permitting it to be operated either automatically or manually with a change-over time of less than 2 min.

Illustrated is the method by which the automatic yoke is attached to the worm wheel, allowing the hand infeed lever to remain on the grinder. The change-

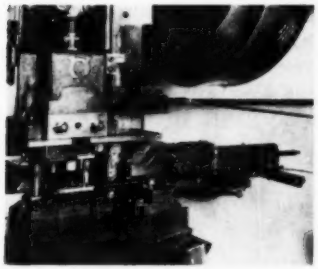
over from manual to automatic operation is accompanied by tightening the pinch bolt on the Auto-Feed yoke and loosening the pinch bolt on the hand infeed lever. The drive arm is actuated by two reciprocating cams. An air-operated ram ejects the work at the finish of each grinding operation. The Auto-Feed is made to handle any tapered or shoulder work.

coils or short lengths. Feeding throughout most of the 360° of press shaft rotation, the feed advances stock over the die at a relatively slow rate of speed, resulting in increased accuracy of feed length when feeding simple piercing and blanking, compound or progressive dies operating at high speed. It handles coiled or short strip up to 3/16 in. thick and any width developed for a given thickness of stock where weight of stock does not exceed 2 lb. per linear foot.

Maximum feed length is 9 in. on presses having 3 in. or more of stroke and approximately three times the stroke for strokes under 3 in. Feed length is adjustable in increments of 0.001 in. Dimensions are 22x12x7 in.



HANDY-CRANE can pick up a load and carry it wherever a tractor can go. It has a high lifting capacity of 4 tons, and it revolves 320° so that loads can be picked up, carried or spotted on either side. The handy crane is mounted on a Model UTI Minneapolis-Moline Tractor. The all-steel welded boom is raised and lowered by means of a hydraulic cylinder —*Clyde Iron Works, Inc., Duluth 1, Minn.*



Automatic Punch-Press Feed Installed on Press Bolster

H. E. Dickerman Mfg. Co., 321 Albany St., Springfield, Mass.

The Rol-Di-Feed, an automatic punch-press feed is a self-contained cam-driven feed which is installed on the press bolster, and in some cases directly on the die shoe, to feed stock in any direction.

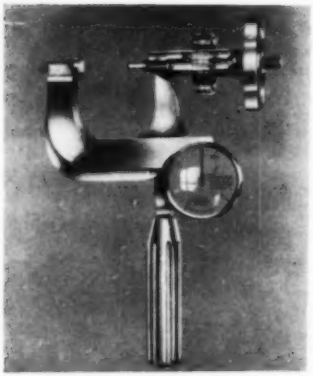
The Rol-Di-Feed being of an open-side design, will feed strip materials, such as fiber, paper, mica and similar materials in almost any width and in continuous

Vertical-Type Cutoff Machine Offers an 18x18-in. Capacity

Grob Brothers, Grafton, Wis.

A vertical-type cutoff machine offers a capacity of 18x18 in. The vertical cutting makes it possible to cut out sections from plates, permits closer adjustment of saw guards to work, and facilitates placing material into the machine.

The frame on which two 18-in. diameter saw wheels are mounted travels on rollers. Cutting cycle of the machine is automatic. There are two graded scales, one alongside the vise and one at the saw frame where the feed stop is located. Electrically controlled work-feed pressure is adjustable from 0 to 100 lb. by a handwheel. Saw blade used is ¾ in. wide by 162 in. long. The upper guide is adjustable to 18 in. A quick-acting vise opens to 22 in. The 1-hp. motor is used for the 5-speed saw-blade drive, and a separate 1/3-hp. motor is used for the automatic work feed. The work feed has an adjustable hydraulic check control which facilitates cutting of sheet metal and thin tubing, as well as cutting through openings in heavy work. Floor space required is 31x58 in; over-all height is 78 in.

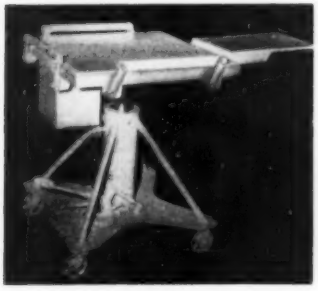


Ames Model 2 Hardness Tester Permits Testing Parts to 2 In.

Ames Precision Machine Works, Waltham 54, Mass.

The Model 2 hardness tester weighs 2½ lb. and can be used to test larger dies, knives, odd-shaped parts and similar materials to 2 in. Tests may be made further in from the end of the sheet stock, than with the Model 1 Tester.

Tests are made directly in the Rockwell scales with the penetrators and pressure loads specified in the Rockwell conversion chart. Brinell equivalents can be figured. Equipment includes: one diamond penetrator, one 1/16-in. ball penetrator, one short and one long flat anvil, one short and one long V anvil, two hard-steel test blocks, one brass test block, a wooden box with hinged cover, and Rockwell conversion chart. The price complete is $225.



Lyon-Raymond Die Transfer Table Incorporates an Overhanging Top

Lyon-Raymond Corp., 7267 Madison St., Greene, N.Y.

Dies can now be transferred from a press having an extended base to a die-handling table by the use of a hydraulic elevating table having an overhanging top. The table is counterweighted to provide proper balance when handling dies weighing up to 300 lb.

Table illustrated is furnished with the overhanging section 14 in. wide by 24 in. long. This section serves to bridge the gap caused by the press base extension. The extension can either be removed completely or tilted up to swing 10° back of the vertical position when not in use. Table can be hydraulically elevated from 28 in. in the lowered position to 44 in. in the elevated position. A 30x30-in. main top is offered.

Adjustable Thread Ring Gages Have Inserted Carbide Segments

Pratt & Whitney, Div. Niles-Bement-Pond Co., West Hartford 1, Conn.

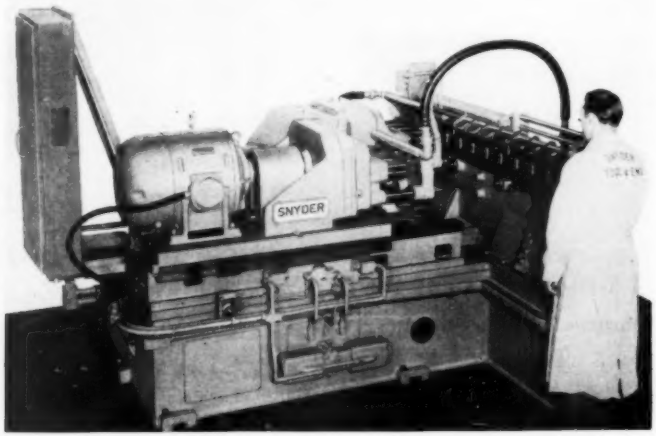
Go and not-go carbide Dualock adjustable thread ring gages are said to eliminate the hazard of gage wear on close-tolerance work. The ring gages have the same AGD locking mechanism as steel rings. They are relieved at the major diameter and are convoluted on both ends to remove partial threads up to the start of the full thread. They are precision lapped to remove grinding marks and irregularities on the thread flanks.

Riehle Portable Hardness Tester Is Offered for Rockwell Readings

Riehle Testing Machines Div., American Machine and Metals, Inc., East Moline, Ill.

A portable hardness tester for Rockwell readings weighs 3 lb. 6 oz. and comes in a carrying case. The hardness tester is said to be comparable in accuracy to bench-type testers. It can be used to get into parts inaccessible to regular bench-type hardness testers, and can test inside and outside surfaces of tubing, castings, and other pieces.

The range of the standard instrument is 5 in. in diameter or thickness. Included with the tester are three test blocks, a flat anvil, V-anvil, convex anvil, diamond and ball indentors, and case.



DRILLING, COUNTER-SINKING AND TAPPING machine reduces the work cycle to 16 sec. on processing automotive upper control-arm assemblies and is said to cut floor space to 25% of former requirements. Machine has one loading and two work stations. The 16-spindle drillhead is equipped with heat-treated alloy spindles. High-speed steel drills are used. Stroke is 10 in.; feed 0.009; speed 60 sfpm. When the drilling and countersinking cycle is completed, parts are automatically shuttled to the tapping station and located and clamped in position. Tapping speed is 40 sfpm. Drilling head is powered by a 20-hp. motor and the tapping head by 10-hp. motor.—*Snyder Tool & Engineering Co., E. Lafayette, Detroit, Mich.*

Lundberg Screw Products Co. makes *better* studs *at lower cost* with J&L ELECTREAT COLD-FINISHED STEEL BARS

J&L STEEL

Cutting precision threads on J&L Electreat Steel with a two-spindle threader at Lundberg Screw Products Co., Lansing, Mich.

Steel costs are reduced 20% to 30% . . . Heat treating of finished studs is eliminated.

Steel studs made by Lundberg for such equipment as truck axles, farm implements and diesel locomotives, must be made to exact specifications.

By using J&L *Electreat* cold-finished bars to replace higher-cost alloys, such as chrome-molybdenum and chrome-nickel-molybdenum, Lundberg not only meets the customer's specifications but also obtains *two savings: Steel costs are reduced*, and *the nuisance and expense of heat treating is eliminated.*

In addition—finished studs are of better quality. They are free from scale and distortion caused by "batch" heat treating. They have clean, sharp threads. Inspection rejects are reduced.

Each bar of J&L *Electreat* cold-finished steel is individually heat treated at the mill by the electric-induction process under exacting control. The flexibility of heat control in the Electreat process permits "tailor-made" combinations of surface and core properties to fit *your* requirements.

Many fabricators of gears, couplings, bolts, nuts, shafts and other steel parts take advantage of these money-saving qualities of J&L *Electreat*. The booklet, "*New* J&L *Electreat* Heat-Treated, Cold-Finished Steel," compares the properties obtained by the Electreat process with conventional "batch" heat-treatment and points the way to greater profits. Let us send you a copy.

Jones & Laughlin Steel Corporation
402 Jones & Laughlin Building
Pittsburgh 19, Pennsylvania

Please send me a copy of "*New* J&L *Electreat* Heat-Treated, Cold-Finished Steel."

Do you recommend Electreat for:

_____

NAME_____

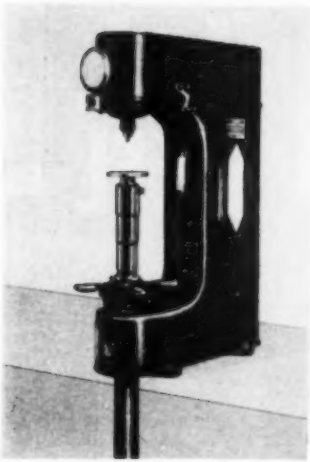
COMPANY NAME_____

ADDRESS_____

JONES & LAUGHLIN STEEL CORPORATION

From its own raw materials, J&L *manufactures a full line of carbon steel products, as well as certain products in* OTISCOLOY *and* JALLOY *(hi-tensile steels).*

PRINCIPAL PRODUCTS: HOT ROLLED AND COLD FINISHED BARS AND SHAPES • STRUCTURAL SHAPES • HOT AND COLD ROLLED STRIP AND SHEETS • TUBULAR, WIRE AND TIN MILL PRODUCTS • "PRECISIONBILT" WIRE ROPE • COAL CHEMICALS

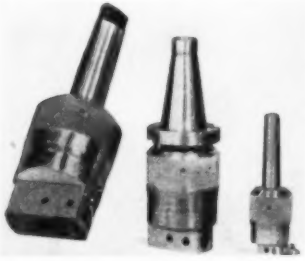


Clark Rockwell Hardness Tester Has Replaceable Spindle Housing

Clark Instrument, Inc., 10200 Ford Road, Dearborn, Mich.

The Clark hardness testers, Models C-8A, C-12A and C-16A, feature a spindle housing and beam assembly that can be replaced by the owner himself without requiring special skill or special tools. Also offered is a frictionless spindle for positive tripping.

The body of the tester is cast in aluminum, and weighs from 65 to 85 lb. less than similar units made from steel or cast iron. The hardness tester is used for Rockwell testing of hard or soft steel, brass, aluminum, cast iron, copper, other metals, alloys and plastics.



Boring, Power Facing Tools Available in Three Sizes

The Maxwell Co., 386 Broadway, Bedford, Ohio

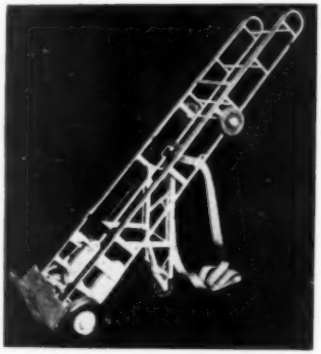
The improved Series 40, E-Z set boring and power facing tools offer new and greater working capacity. They are available in three sizes Models 40, 41 and 42 which have cutter block travel of ¾, 1⅝ and 2¼ in. respectively. Boring capacities range from ⅜ to 20 in. and are made possible by the three-position feature in each head for positioning of the boring bar.

The feed of the cutter point is extremely fine for the purpose of generating a better finish with a single-point facing, and it ranges from 0.0025 ipr. on the smallest tool to 0.0035 ipr. on the largest tool. Another improvement includes the simplification of the facing mechanism so that the tool is used to support the cutter.

Hacksaw by Machine Rebuilding, Handles 10- or 12-in. Blades

Machine Rebuilding Co., 2742 Chene St., Detroit 7, Mich.

The rigid hacksaw is designed as a precision tool. A one-piece steel tube back is fitted into a precision-machined cast-aluminum handle by means of a setscrew arrangement, enabling the blade to be tightened to high tension. It is said to maintain true alignment without twisting the blade or warping the frame. The hacksaw is adjustable for 10- or 12-in. blade and weighs 1 lb., 6 oz.



Truck With Caterpillar Tread Crawls Up a Flight of Stairs

Associated Services, 224 W. Main St., Carlinville, Ill.

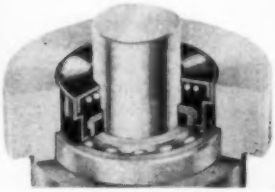
The Model Escort truck has been developed for use where there is a problem of moving over curbings or up a flight of stairs. The tread rolls easily over steel bearings set in an aluminum frame. The load is distributed evenly from step to step and allows for even handling up or down without the danger of chipped or marred stairways. The retractable swivel wheel on the model illustrated supports the entire load when rolling on a level floor. The steel model of this type has a capacity of 1500 lb. Other models are available.

Keller Portable Tool Balancer Suspends Tools Up to 10 lb.

Keller Tool Co., Grand Haven, Mich.

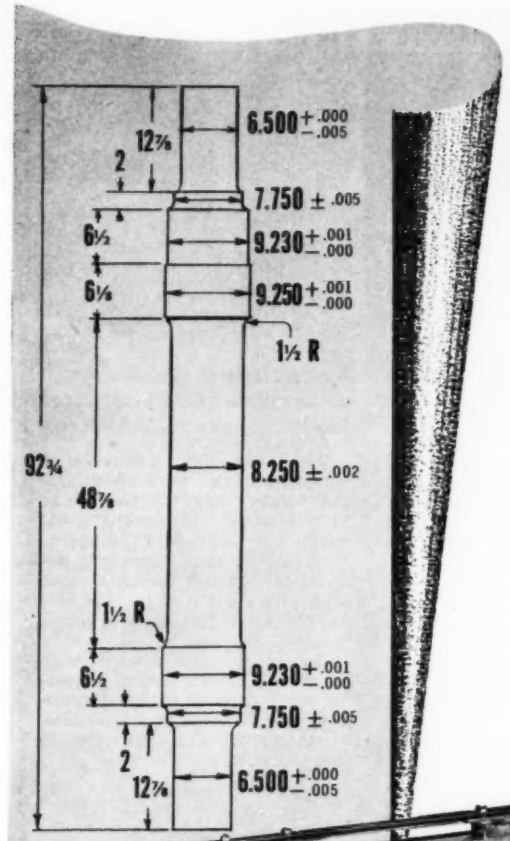
Portable tool balancer will suspend tools weighing up to 10 lb. near the working area. The balancer is adjustable for all tool types and has a working range of 6 ft.

Little effort is said to be required to bring tools to the job. When released they return to a pre-set position, determined by the position of a clamp and rubber bumper on the wire rope.



PACKAGED SEAL UNIT is designed for horizontal- and vertical-rotating shafts. With both rotating and stationary surfaces built inside a metal cartridge, this seal permits an installation using a radial seal joint which does not wear on the shaft, bearing race or any other part in the machine or pump. Seal faces are machine lapped uniformly flat. They must pass a rigid flatness test designed to assure a leakproof seal joint prior to leaving the factory. *Seal Div., Gits Bros. Mfg. Co., 1846 S. Kilbourn Ave., Chicago 23, Ill.*

How to SAVE 69 MINUTES Every 21 minutes



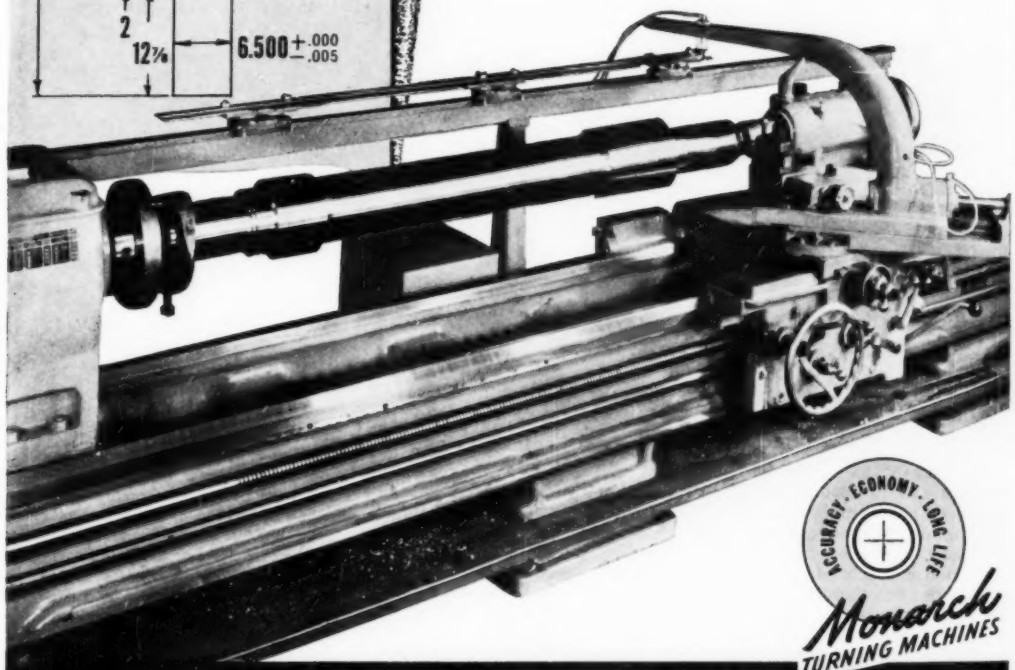
Smooth, stepless, single-point turning of all surfaces from a master template is the secret of such savings in machining time.

That's the Monarch Air-Gage Tracer turning method—and the 76% saving is characteristic of its regular performance on a wide variety of production jobs—step shafts; contour turning, boring and facing.

The locomotive axle illustrated required 90 minutes to machine with a conventional, manually-operated engine lathe. But the eight diameters to be turned present no such time-consuming problems for Air-Gage Tracing. In spite of the workpiece size, in spite of the unusually accurate results required, turning time is cut to 21 minutes.

That's a typical Air-Gage Tracer example of the saving to be expected on machining time. But there are other savings, too. On all Air-Gage Tracer jobs, setup times are reduced. Frequently, second operations are eliminated. And automatic turning permits one operator to handle two machines—*easily*. Original equipment costs are lower—as are tool maintenance charges. Best of all, Air-Gage Tracing is equally applicable on large lots or small, big parts or little. The method is versatile enough to meet every type of production need. Like more facts? Ask for bulletin 2604.

THE MONARCH MACHINE TOOL CO., SIDNEY, OHIO



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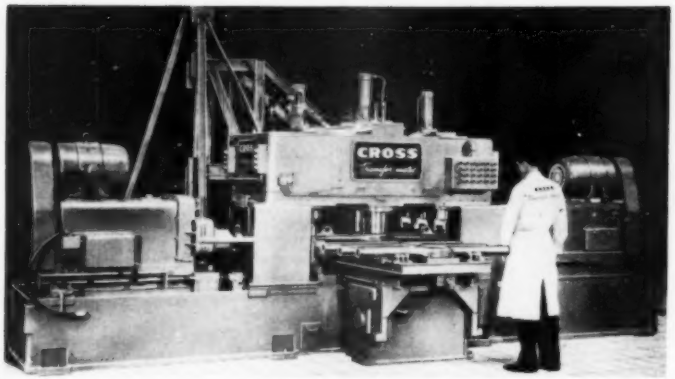
Monarch TURNING MACHINES

FOR A GOOD TURN *FASTER*—TURN TO MONARCH



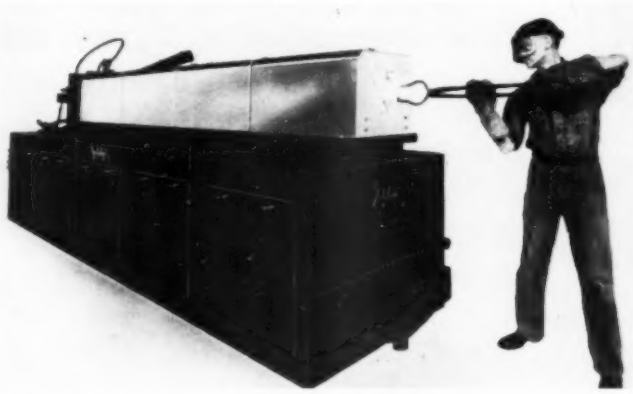
SPECIAL MACHINE bores and faces three types of automotive-axle housings without changing the setup. At 100% efficiency, 280 parts are processed per hr. with one unskilled operator. Machine is a three-station transfer-type unit, a Transfer-matic, equipped with material-handling devices to automatically move parts from one operation to the next. At the first station, any of the three types of axles is loaded. At the second, both ends are bored and faced with the machine automatically adjusting for length through an electric-eye setup. At the third station, parts are automatically sorted by type and placed on either of two conveyors depending upon subsequent processing— *The Cross Co., Bellevue Ave., Detroit, Mich.*

Bradford Electric Disk Sanders Operate at 5200 No-Load Speed

Bradford Machine Tool Co., Cincinnati, Ohio

Vertical-spindle construction is employed in two portable electric disk sanders, added to the line of "Metalmaster" tools. The 7-in. heavy-duty and 9-in. standard-duty sanders have a rear grip position to maintain correct balance in any working position. The side handle can be attached to either right- or left-hand sides.

Both models are powered with universal 110-volt ac. and dc. motor which operates at 5200 rpm. no-load speed. The housing is made of aluminum and the tools weigh 10 and 11 lb. respectively.

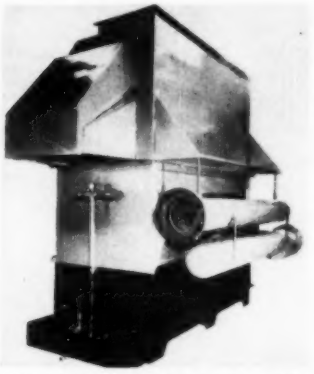


Ajax-Northrup Induction Heater Heats 750 Forging Blanks Per Hour

Ajax Electrothermic Corp., Trenton 5, N.J.

An Ajax-Northrup heater delivers a 2½x3 15/16-in. steel blank every 4.8 sec. to the mouth of the forging machine—every blank at a closely controlled 2200 F. The induction heater heats 750 forging blanks per hr. Blanks are fed into a chute at the far end from which they are automatically fed into the heating coil by a hydraulic pusher.

Timing is fully automatic. The heater can handle a wide variety of forging blanks. With adjustments it can be set to heat any length of slug up to the maximum stroke of the ram. The coils are interchangeable permitting smaller or larger diameter coils to be substituted in order to give greater efficiency on long-run small-diameter work, or to accommodate larger diameters than 2½ in. The heaters illustrated will accommodate square or round billets up to 2½ in. dia. Power source is a 700-kw. motor-generator unit.



AERO AFTER COOLER offers simplified construction and is protected from freezing in outdoor installations. The equipment dehydrates compressed air or gas by cooling it to a temperature below the dry-bulb temperature of the atmospheric air, thereby removing the moisture that condenses at that point, and preventing further condensation of water in air or gas lines in use. Protection against freezing is given by the use of balanced wet-bulb control.—*Niagara Blower Co., 405 Lexington Ave., New York 17, N.Y.*

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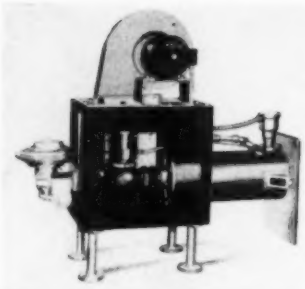


Eclipse Gas Pak Firing Unit Is Automatic, Self-Contained

Eclipse Fuel Engineering Co., 764 S. Main St., Rockford, Ill.

A gas combustion assembly called the Eclipse Gas Pak is for automatic firing of different types of heating equipment. The packaged unit comprises the blower, burner, mixer, safety equipment, valves, regulator, piping and wiring. The unit is automatic after gas and electric supply have been turned on. A built-in electronic-type, flame-failure unit is provided which closes the main solenoid valve instantly in event of pilot-flame failure.

Towmotor High Free-Lift Mast Features Total Lift of 130 in.

Towmotor Corporation, 1226 E. 152nd Street, Cleveland 10, Ohio

A high free-lift mast is offered on the Towmotor Models LT-40, LT-44 and LT-48. The high lift Towmotor models have a total lift of 130 in. and a free lift of 65 in. with lowered mast height of 83 in. It comes on three models with capacities from 3000 to 5000 lb.

Rogers Hydraulic Knife Grinder Offers Speeds from 10 to 70 fpm.

Samuel C. Rogers & Co., Buffalo 11, N.Y.

The type NT hydraulic knife grinder provides variable table speeds from 10 to 70 fpm. A high work speed giving a rough finish can be hydraulically reduced accurately and automatically without stopping the machine, to a lower speed giving a high finish. Self-aligning 5-in. V-ways on the cabinet base and carriage absorb the grinding pressure and permit heavy cuts and fast feeds with a minimum of vibration.

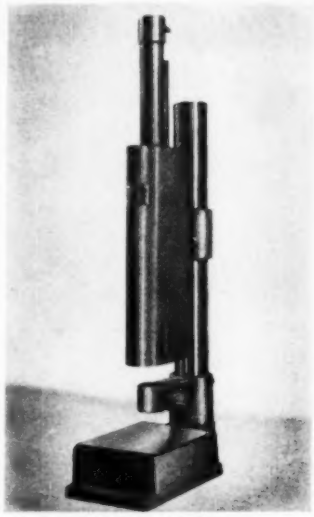
An automatic motor-driven oiling system provides a constant, lean film of oil for tables and bed ways. A separate 2-hp. motor controls the hydraulic system and the 16-in. segmental grinding wheel is operated from a 7½-hp. or 10-hp. motor as desired. Seven sizes of the hydraulic NT grinder are available: 38, 48, 78, 90, 102, 110, and 134 in.

Hydro-Finish Cabinet Offers Abrasive Suspended in Liquid

Pangborn Corporation, Hagerstown, Md.

The Hydro-Finish is a modified form of impact blasting with an abrasive suspended in a liquid. Fine mesh abrasives can be used, allowing the blast cleaning of precision machined parts and holding of tolerances to 0.0001 in. There is said to be no breakdown of sharp edges and corners.

Because of the non-directional finish obtained, the process is being used in the maintenance of dies and molds. Hydro-finish cabinets are available in four sizes requiring floor space of 30x36 in., 48x36 in., 60x48 in., and 72x60 in., and ranging from 7 ft. 10 in. to 10 ft. 9 in. in height.



Mead Model 105 Impact Air Hammer Offers 7x9-in. Working Surface

Mead Specialties Co., Dept. IH4, 4114 N. Knox Ave., Chicago 41, Ill.

The Model 105 impact air hammer has a capacity of 15,000 lb. at point of impact. The working surface of the table is 7x9 in.; over-all height is 44⅛ in.; throat depth is 4½ in.; maximum daylight opening is 18 in., and the maximum stroke is 8 in.

STEEL-PLATE CLAMP handles all plates of ¼ to 2 in. Named the Marbo-Clamp, it operates on the principle that the heavier the plate, the greater the leverage, the tighter the grip. The clamp measures 9x12 in. Gripping teeth are hardened to prevent tooth breakage or chipping—*The Marboltt Weld Co., 4389 Martin Ave., Cleveland, Ohio*

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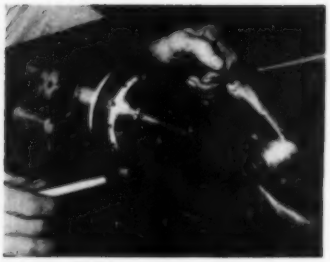


Quick-Acting Collet Chuck Speeds Milling and Slotting

Goodwin Mfg. Co., 10 E. Broadway, Cuyahoga Falls, Ohio

A quick-acting collet chuck suitable for use on milling machines, can be mounted on the index plate in either vertical or horizontal position for semi-automatic milling and slotting operations.

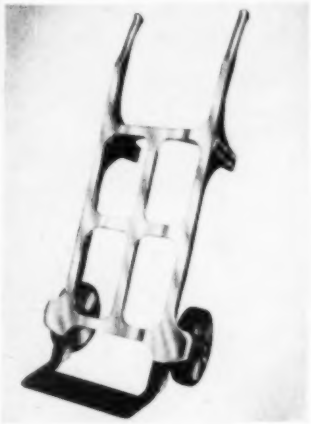
The chuck illustrated is mounted on an angle plate to permit the slotting of a $\frac{3}{8}$x2$\frac{1}{2}$-in. pivot pin to a depth of 2$\frac{1}{8}$ in. The chuck is shown holding the pin by $\frac{3}{8}$ in. A spring ejector available as an attachment can be supplied with the chuck for rapid removal of the workpiece in a production job. Chucks for use on milling machines are available with either 1- or 2-in. capacities.

Calculating Wrist Watch Offers Precision Slide Rule Around Dial

Juvenia Watch Agency, Inc., 604 Fifth Ave., New York, N.Y.

The Arithmo calculating wrist watch features an accurate precision slide rule built around the dial. The slide index on the Arithmo is automatically controlled; on turning the rim into which the watch crystal is set, the slide index made of unbreakable glass automatically rotates.

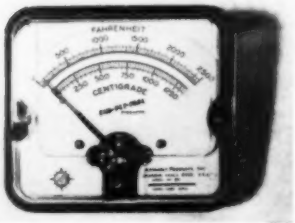
The pointer is made to face noon and it remains there although the rim goes on revolving. It starts again in the opposite direction as soon as the rim is turned the other way. All figures to be read are always in their normal positions and all results are found in the same place. The watch is made with a 17-jewel Swiss movement and is listed in polished stainless steel for $100, or in 18 karat gold for $300.



Multi-Purpose Type Hand Truck Will Operate Without Greasing

Aerol Co. Inc., 2820 Ontario St., Burbank, Calif.

Aerotruker, a new multi-purpose hand truck can be operated through its normal life without greasing. A rugged, cast single-unit frame eliminates tightening or replacement of loose members. It rolls on Aerol rubber-tired wheels. The truck is corrosion resistant, rust-proof and can be made spark-proof.



Fahrenheit, Centigrade Scales Offered on Pyrometer Indicator

Assembly Products, Inc., Main and Bell Streets, Chagrin Falls, Ohio

The Simplytrol indicating pyrometers have dials calibrated in both Fahrenheit and Centigrade. Scales are over 3 in. long. The meter case measures 3$\frac{3}{4}$x3$\frac{3}{8}$ in. and has a one-piece clear plastic front.

The indicators can be used for measuring temperature in ceramic kilns, as well as furnaces and ovens, and various types of baths. They are offered in several ranges for heat up to 2500 F. and 1370 C. Four ohms per mv. give a high resistance of 212 ohms for 2500 F. Thermocouples do not need calibrated leads.

Stanley Push-Pull Flexible Rules Offered in 6- and 8-ft. Lengths

Stanley Tools, New Britain, Conn.

The Pull-push rules Nos. 346 and 348, feature die-cast D-shaped cases, triple plated—chrome over nickel over copper. The rules feature vertical marking and a quick-change blade with positive fastening. Blades are rigid steel for measuring straight distances in any position and flexible for circumferences and irregular shapes. They are available in 6- and 8-ft. lengths.

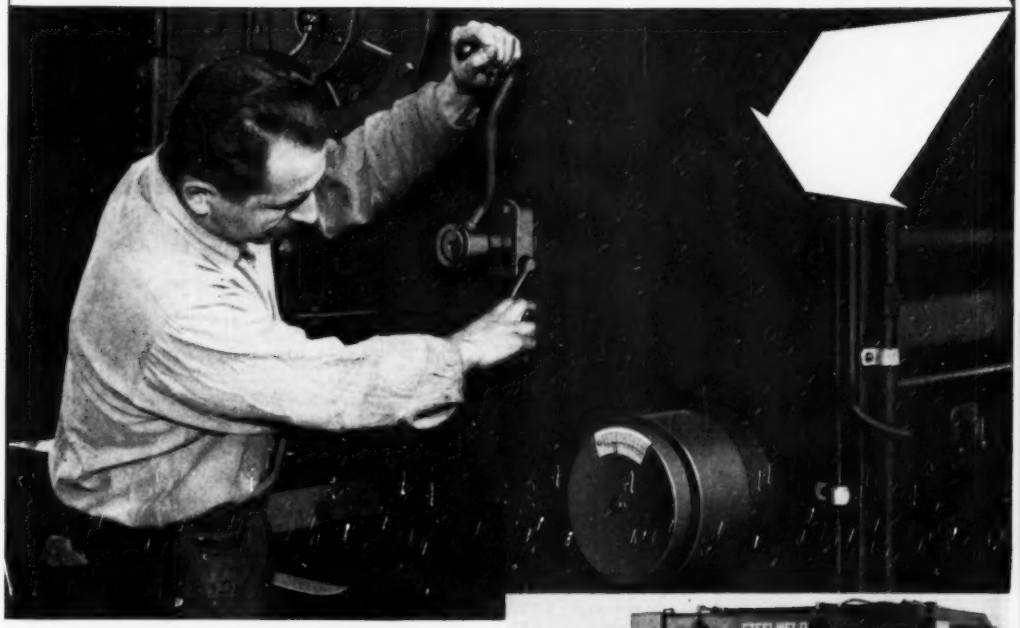
Automatic Stop-Fire Extinguisher Is Portable, Has Sprinkler Head

Stop-Fire, Inc., 125 Ashland Place, Brooklyn 1, N.Y.

An automatic-sprinkler portable-system fire extinguisher is offered with a sprinkler head which discharges under pressure a wide fast-moving spray of combined carbon dioxide and atomized Chlorobromomethane.

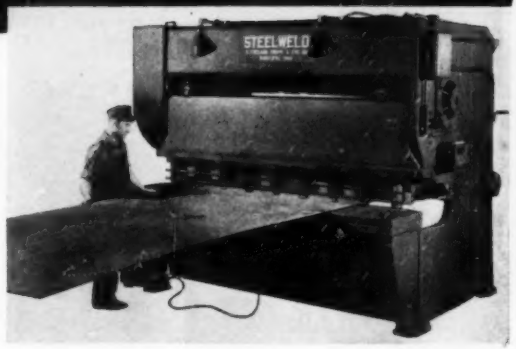
The unit is constructed of brass, is silver welded, and needs no piping or other installation. It is hung up and ready to operate, utilizing the fire extinguisher fluid known as C.B.M. It is equally efficient on oil, grease, flammable liquid, lacquer, paint solvent, or electrical fires. It has a minimum specification capacity of 700 cu. ft.

KNIFE CLEARANCE *Easily Adjusted* FOR ANY THICKNESS . . . . .



THERE is a direct relation between thickness of plate cut and clearance between knives for most satisfactory results. To properly set this clearance when changing from one plate thickness to another has been made extremely simple in Steelweld Shears.

The need of moving the shear bed, adjusting various nuts, testing the knife clearance with feelers, etc., has been eliminated. Such bothersome, time-consuming work has been reduced to the mere turning of a convenient crank. A large dial indicator indicates the clearance in thousandths of an inch and also shows the plate thickness that may be cut for any knife setting. Because knife adjustment has been made so easy, operators willingly make it on Steelweld Shears and thereby get the best possible cuts for every plate thickness—and knives remain sharper for longer periods.



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THE CLEVELAND CRANE & ENGINEERING CO.

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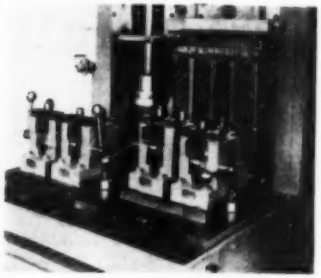
STEELWELD PIVOTED BLADE SHEARS

Model B Wheel Dresser by Matco For Surface, External Grinders

Matco Tool Co., 2830-36 W. Lake St., Chicago 12, Ill.

The Model B wheel dresser is offered for surface and external grinders. The width of the wheel capacity is 1⅜ in. The vertical travel of the diamond is 1½ in. allowing 3-in. wheel wear. The width of the base is 2¼x3⅝ in.

One revolution of the dial feeds the diamond 0.050 in. Special features include a takeup screw for diamond feed screw, and a takeup screw for horizontal feed screw, as well as four elevating screws for alignment.

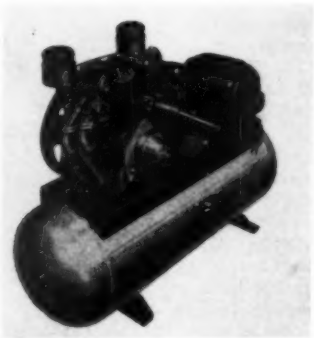


5-Ton Surface Broaching Machine Produces 600 Rod Caps Per Hour

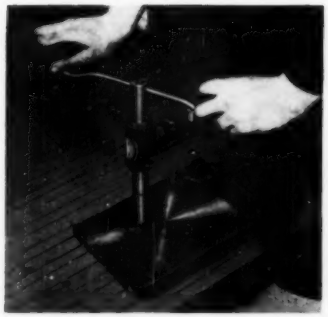
Colonial Broach Co., Detroit, Mich.

A 5-ton, 42-in. stroke dual-ram surface-broaching machine produces 600 connecting rod caps of two styles per hr. Four operations are performed each cycle. The left-hand ram produces two parts for each cutting stroke; the operation being to broach the parting face and sizes of the bosses, simultaneously. On the right-hand ram two parts are produced, the operation here being to broach the stepped faces on both sides of the half-round, including a 1/32 in.-45° chamfer joining the two steps in both faces.

MARKING MACHINE rolls data into nameplates. Voltage, model number, code, type, size and other data are stamped into the etched nameplates by this rolling method. When quantities of nameplates are to be filled in blank panels all with the same data, the hand-operated machine handles them at a rate of from 25 to 30 large plates per min.—*The Acromark Co., 7-13 Morrell St., Elizabeth 4, N.J.*



AIR COMPRESSORS are offered in two sizes providing respectively 30 and 40 cu.ft. at 175-lb. pressure and 37- and 50-cu.ft. displacement as low-pressure models (100 lb.). These are listed respectively as Model W-3608-H, an 8½-hp. unit, and also as a 10-hp. unit. The bore and stroke of the low-pressure cylinder are 4¾x3 in. Compressors operate at low speeds: 490 rpm. for the 7½ hp., and 650 rpm. for the 10 hp. Shown is a continuous unloader available as an accessory. —*Wayne Pump Co., Fort Wayne 4, Ind.*



Portable Tap Guide by Dahlstrom Fits Tailstock of Ordinary Lathe

Dahlstrom Mfg. Co., Dept. B, 2520 Larpenteur Ave., St. Paul, Minn.

A new model Dahlstrom tap guide can be used for hand-tapping and will also fit into the tailstock of an ordinary lathe. The spindle pulls out for lathe use, or as a tap extension for hard-to-get-at places.

The portable machine as a hand operation, takes a few turns of the spindle, winds through continuously with no backoffs. It is 13x8x14 in. high and includes 7 adapters. The tap guide retails for $52.50 fob. St. Paul.

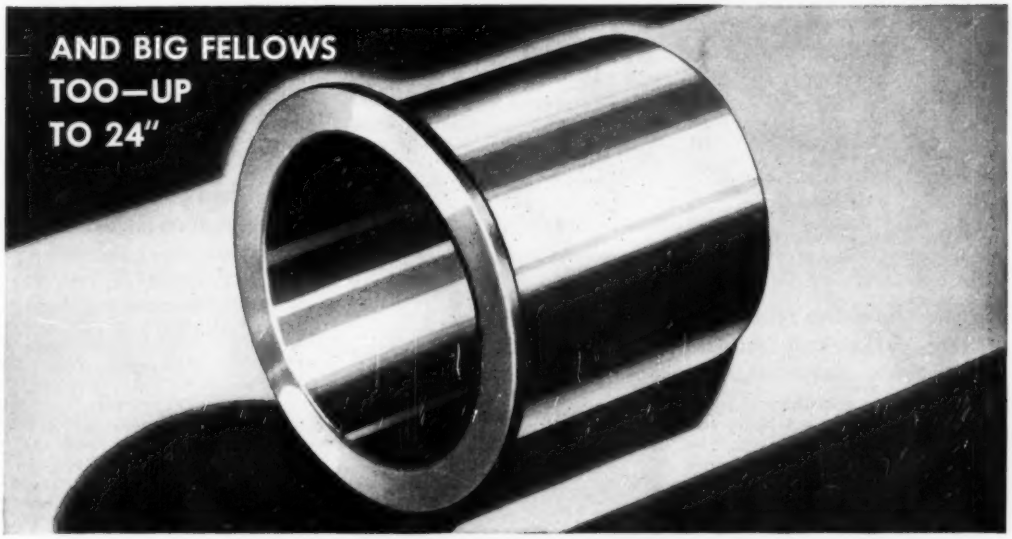
Acme E5 Universal Tool Mount Has a 38-in. Vertical Movement

Acme Steel Co., Strapping Div., Chicago 8, Ill.

The Acme E5 universal tool mount has rubber casters, four leveling screws, and a 17-in. vertical movement without post adjustment. It reaches a post adjustment of 21 in. or a total of 38 in. of vertical movement. The strapping tool can be used in a 360° circle around the post which facilitates cross-strapping.

OILITE

THE *Oil Cushion* BEARING



. . . with Automatic Self-Lubrication

Plain Sleeve

OILITE is the heavy-duty OIL CUSHION Bearing built for surplus performance capacity necessary to meet unexpected emergencies. OILITE Bearings are used on all types of equipment from toy trains to heavy locomotives. They furnish metered lubrication without waste. Additional OILITE advantages are:

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Thrust

AMPLEX MANUFACTURING CO. DETROIT, 31 MICHIGAN

Division of Chrysler Corporation

FIELD ENGINEERS AND SUPPLY DEPOTS IN PRINCIPAL CITIES

Parts and Materials

Bellows, Air-Powered Valve Is Electrically Controlled

The Bellows Co., Akron, Ohio

A solenoid-actuated air-controlled valve operates at speeds over 2200 movements per min. The valve consists of a cast-bronze body incorporating a single air inlet, suitable electrical terminals, and a cylinder in which floats a light weight piston. The piston engages and shifts a four-way shear-flow air valve. The caps inclosing each end of the cylinder hold small 8-volt solenoids, whose plungers, operating through 1/32 in. of movement, release the full pressure of the air supply line to drive the piston.

The valve will operate on 5- to 150-lb. airline pressure. It is available in ¼- and ⅜-in. port sizes, complete with a special transformer to reduce normal line voltage to the required 8 volts.

Nickel, Other Metal Coatings Dissolved by Chemical Stripper

Enthone, Inc., 442 Elm Street, New Haven 2, Conn.

A chemical stripper dissolves nickel and other metal coatings from steel without attacking the steel. The stripper is alkaline in nature, can be kept in a steel tank and requires no electric current. The parts to be stripped are immersed in a solution in a temperature range from 160-180 F.

Stripping speed varies from 0.0002 in. to over 0.001 in. per hr., depending upon the concentration of the salt and the operating temperature. The process can be used for removing nickel plate from bulk work, such as barrel nickel-plated steel.

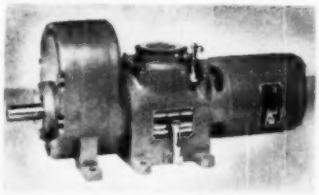
The stripper is also effective for removing copper plate from steel as well as silver, cadmium and zinc. The solution is not suitable for removing nickel coating from zinc-base die castings as well as from copper alloys.

Westinghouse Single-Phase Control Announced for Resistance Welding

Westinghouse Electric Corp., P.O. Box 868, Pittsburgh, Pa.

A single-phase to single-phase low-frequency electronic welding control is said to have lower kva. demand and a higher power factor than the standard single-phase to single-phase control, and makes possible welding of scaly or rusty steel with a minimum of spitting from the electrodes. It also can be used for welding brass or aluminum.

The control is a frequency converter which by means of electronic tubes, converts current at line frequency to current at lower frequency. The control is designed for connection to a resistance welding machine having a specially constructed transformer with a center tapped primary.

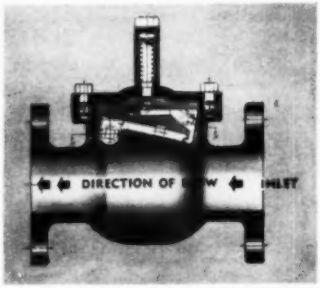


Variable-Speed Transmission Gives High Torque, Low Speed

Graham Transmissions, Inc., 3754 N. Holton St., Milwaukee 12, Wis.

A double-spur-reduction variable-speed transmission is used where high torque and low speeds are required. Micrometer control permits speed to be set within 1 400 of the dial periphery.

The double-reduction model is available in sizes from ¼ to 1½ hp., with speeds ranging from 75 rpm. to 0 to 9 rpm. to 0. Other models are available in sizes down to 1/30th hp. The transmission incorporates the loader, variable-speed transmission and gear reducer.

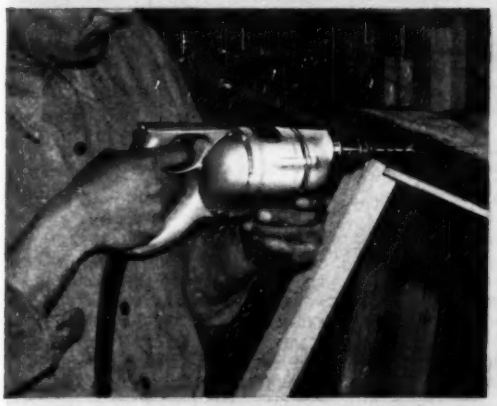


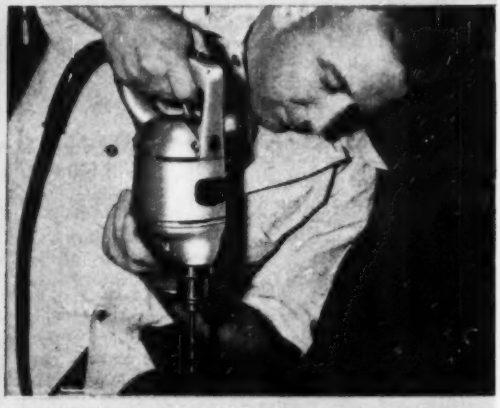
LOW-PRESSURE SHUT-OFF VALVES incorporate a precision-lapped synthetic-rubber seat. The improved models of the Warden automatic valve are recommended for use on gas or fluid lines where closure is desired when pressure fails from any cause. The valve must be reset manually after closure. Valves are available in models for both low- and high-pressure use. Warden valves are furnished in sizes ¾ to 8 in.—*Security Valve Co., 410 San Fernando Road, Los Angeles, Calif.*

for Better, Faster, Lower-Cost Work . . .

1/4" JUNIOR DRILL—For Light, Intermittent Drilling and Odd-Job Use $28.00

1/4" HOLGUN* — For Light Gage Metal Production Assembly Work $38.00





1/4" STANDARD DRILL—For Maintenance and Medium Production Work $44.00

1/4" HEAVY-DUTY DRILL — For Heaviest, Continuous Production Drilling $50.00

Buy Black & Decker Electric Drills . . . and you're sure to get the *right* Drill for *every* job! Nowhere else can you find the wide selection of models (25 in all, from 1/4" to 1 1/4" capacity) . . . the unmatched quality construction that means extra years of service . . . famous full-power Black & Decker-built motors that *can't be stalled* . . . a choice of handles for convenient operation, a choice of speed in many models!

These FOUR 1/4" Drills are an example. Each is designed for a particular type of application. Each gives you the most for your money in its class! Call your nearby Black & Decker Distributor today for free demonstrations of the many B&D Portable Electric Drills, *the world's most complete line!* Write for detailed catalog to: The Black & Decker Mfg. Co., 616 Pennsylvania Ave., Towson 4, Maryland.

*Trade Mark Reg. U. S. Pat. Off.

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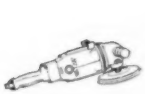
Black & Decker

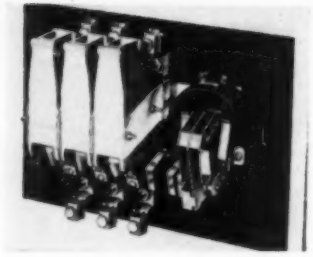
PORTABLE ELECTRIC TOOLS


SANDERS

BENCH GRINDERS

SAWS

SCREW DRIVERS



Ward Leonard Magnetic Contactors For Motor, Heater, Lamp Control

Ward Leonard Electric Co., 31 South St., Mt. Vernon, N.Y.

The Bulletin 4454 size 4 and Bulletin 4455 size 5 ac. magnetic contactors are introduced for motor, heater and lamp control purposes. The 150- and 350-amp. ac. magnetic contactors offer movable and stationary contacts on both sizes which are identical and interchangeable.

Size 4 contactors are available with a maximum of 5 main poles, and size 5 units have two or three poles only. Both sizes can be supplied with open-type construction or with NEMA type 1 inclosures.

Coils are available for operation on 110, 208-220, 440 and 550 volts on frequencies of 25, 50 or 60 cycles. The maximum inclosed power ratings for size 5 contactors is 200 hp., 550 volts, 3 phase, 60 cycles.

Cast Iron, Cast Steel Advantages Combined in Ductile Cast Iron

The International Nickel Co. Inc., 67 Wall St., New York 5, N.Y.

Ductile cast iron combines the process advantages of gray cast iron such as fluidity, castability and machinability, with the product advantages of cast steel. The material is characterized by a graphite structure in the form of spheroids, free from graphite in the flake form. Its physical properties, particularly high elastic modulus, high yield strength, and ductility, suggest its suitability for many applications hitherto considered beyond the scope of cast iron.

Production of this iron can be applied to common cast iron compositions melted in the cupola or in other kinds of furnaces, and is based on the introduction into the iron of a small amount of magnesium, or a magnesium-containing additive agent, such as nickel-magnesium alloy.

Method for Drawing Stainless Wire Without Lead Coating Is Announced

Magnus Chemical Co. Inc., Metal Coatings Div., Garwood, N.J.

A method of drawing stainless steel wire is introduced, eliminating the use of lead coating. With the new technique it is possible to draw stainless steel continuously from No. 5 rod down to the finest sizes without lead. It is said that this operation can be performed at a production cost no higher than that for carbon wire.

Rotary Valve for Liquid Meters Will Handle All Types of Fluids

Morganite Inc., 3304—48th Ave., Long Island City 1, N.Y.

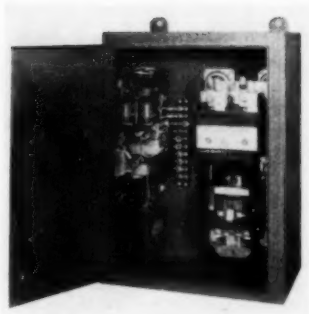
A rotary valve for liquid meters handles all types of fluids. The self-lubricating valve is resistant to corrosion and severe chemical attack. When placed in actual service, sticking and friction caused by wax and gummy deposits which heretofore caused incorrect readings and constant service failures were said to be almost entirely eliminated.

Ruthman Explosion-Proof Motors Are Introduced for Gusher Pumps

The Ruthman Machinery Co., Cincinnati 2, Ohio

An explosion-proof polyphase motor is available in sizes ¼, ½ and ¾ hp. for any Gusher pump within this horsepower range. Motors are suitable for use in hazardous locations and have passed the Underwriters' Laboratory Test Class I, Group D.

The Model UL-7124-EXP, illustrated, is installed on a totally inclosed portable tank. The unit with a ¼-hp. explosion-proof motor, was developed for pumping high volatile inks in the printing industry.



CONTROL COMBINATION Model 106-53BA1 utilizes the NEMA 1A timer, plus a high-speed magnetic contactor. The control combination is offered for small welders for mounting to right-hand side. Control panel is placed so that controls face the operator. The cabinet measures 17x14⅜ x8 in. deep. The control is a packaged unit wired and ready to install. The weld time has a continuous adjustment from 3 to 120 cycles.—*Weltronic Co., 19420 W. 8 Mile Road, Detroit 19, Mich.*

Temperature Indicating Products Available for Intermediate Range

Tempil Corporation, 132 W. 22nd St., New York 11, N.Y.

Tempilsticks (crayons), Tempilaq (liquid), and Tempil Pellets are now available in 12½° intervals for intermediate temperatures ranging from 113 F. to 450 F. and from 450 to 1600 F. Tempilsticks and Tempilaq are available in 50° increments while Tempil Pellets can be had to 1700 F.

Tremco Colorfloor XX Enamel For Painting Concrete Floors

Tremco Mfg. Co., Cleveland, Ohio

Colorfloor XX, a floor enamel paint for concrete floors, uses a rubber base which is resistant to free lime. Colorfloor XX is said to dry within 24 hours leaving no lingering odor and offers good abrasive resistance.

Applied safely to concrete floors where no hydrostatic pressure exists, it protects from dampness and mustiness. No special primers or sealers are required. It is available in red, gray and dark green, and depending upon quantity and color, costs from $4.95 to $5.25 per gal.

For Long Life and Low End Cost in Hard-Working Steel Parts . . .

. . . use *Republic* Cold Drawn Alloy Steel Bars

LONG LIFE—Because Republic Alloy Steels provide these long-proved advantages: (1) High strength to carry heavy loads; (2) Toughness to withstand severe shock and strain; (3) Uniform response to hardening treatment that produces hard bearing areas.

LOW END COST—(1) Because the long life of steel parts made of Republic Alloy Steels means fewer repairs and replacements—less maintenance expense—more operating time and less down-time. (2) Because these bars provide the UNIFORM MACHINABILITY, accuracy of section, close tolerances and fine surface finish for which Union Cold Drawn Products are so well known—and which means lowest possible parts production costs.

Republic Cold Drawn Alloy Steel Bars are available in all popular analyses, in standard shapes and sizes, furnace treated as you desire—annealed, normalized, spheroidized, stress relieved or carbon corrected. Republic metallurgists are ready to help you get the results you need. Write for further information.

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Republic COLD DRAWN
REPUBLIC STEEL
ALLOY STEEL BARS

Other Republic Products include Carbon and Stainless Steels—Sheets, Strip, Plates, Pipe, Bars, Wire, Pig Iron, Bolts and Nuts, Tubing

Quite frankly we do not intend to "mechanize" the above marking operation. We doubt that any machine would give as much satisfaction as the old-fashioned method. But the Noblewest Model 279, illustrated, does mark the case of the lipstick used by the young lady who left her mark. And more important to you is the fact that this addition to the Noblewest line can be tooled for marking a large variety of products in metal, plastic, hard rubber, wood, etc. Employs the famed Noblewest roll marking process. The inscription (including the delicate decorative design) is permanently rolled in—lasts as long as the product itself. You, too, can mark your products faster, better, cheaper with Noblewest Production Marking Equipment. Write NOBLE & WESTBROOK MANUFACTURING CO., 17 Westbrook Street, East Hartford 8, Conn.

MARK IT BEST WITH NOBLEWEST

EQUIPMENT FOR MARKING · GRADUATING · EMBOSSING · NUMBERING

College Shop Courses

A survey of present practice, based on over 60 letters from deans and professors of engineering in as many colleges. A supplement to the discussion on pages 85-91 of this issue

Alabama Polytechnic Institute—Shop courses ever since founding in 1872. All engineering students take three orientation courses (Woodworking and Patternmaking, Machine Shop Practice and a choice of Welding or Sheet Metal Working) in Freshman year, to teach shop methods and processes and machine operation. Senior courses in Gages and Measurements, Time and Motion Study, Manufacturing Processes, and Production Control, use shops as laboratories (These courses required for Industrial Management degree.)

University of Arizona—Requires 8 semester units in machine shop and welding shop of M.E. students, 4 for E.E. Half theory, half practical. Attempt to familiarize students with what can be done with various machine tools, what materials can be machined, the amount of power required to run various tools and machine various materials, routing of work through shops, shop layout—i.e., from an engineering standpoint.

Brooklyn Polytechnic Institute—Courses in "industrial working processes" cover all basic fabricating methods, production processes, (M.E.-2) in which tools are actually used and operated.

University of Buffalo—Engineering course only three years old. Teaching by lecture and demonstration only.

California Institute of Technology—No shop courses.

Carnegie Institute of Technology—No shop courses.

Case Institute of Technology—". . . still offer some machine training to all our graduates."

University of Cincinnati—Cooperative plan; student spends periods in approved shops in industry.

Columbia University—No shop courses.

University of Florida—All M.E.'s take two 3-credit courses (two 1-hr.

THE CAMPBELL THAT ~~CUTS~~ THE COST OF CUTTING

For every cutting operation, there is one most economical method.

For many cutting operations, this is it.

It's the new CAMPBELL MODEL 223 WET ABRASIVE CUTTING MACHINE. It is the machine especially developed for faster cutting, easier operation, longer wheel life and . . .

LOWER FIRST COST

It is the most widely useful Campbell Abrasive Cutter ever built.

We suggest you send for BULLETIN DH-30 that gives you complete information.

- Wheel Guides
- Separate Coolant Tank
- Five Inch Wheel Flange
- Automatic Work Stop
- Automatic Coolant Pump Operation
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SEND FOR BULLETIN DH-30

MODEL 223

ACCO

TRADE MARK

CAMPBELL MACHINE DIVISION
AMERICAN CHAIN & CABLE
923 Connecticut Avenue, Bridgeport 2, Conn.

CAMPBELL
Abrasive Cutters and Nibbling Machines

Production Increase—400%
The addition of three Bellows Air Motors to a standard milling machine jumped production from 2000 piece parts from two hand operated machines to 4000 parts from one Bellows "Controlled-Air" Powered machine.
Foto Facts File FF-47-793
Production Increase—370%
The output of this standard drill press in countersinking a 1113 steel bushing (.315" hole, 1/32" deep, 60°) rose from 7000 per day to 26000 per day when a Bellows "Controlled-Air" Power Feed was installed. The drill press runs continuously, all the operator has to do is keep the chute full of parts.
Foto Facts File FF-47-381
These Inexpensive Air Powered Units Can Double the Output of Standard Machine Tools
Two Bellows "Controlled-Air" Power Feeds synchronized to fixture operated by Bellows solenoid-actuated Air Motor more than triple production in cross-drilling two sets of holes in door adapter bar.
Foto Facts File FF-47-777
Production Increase—360%

PRODUCTION of such standard machines as drill presses, tapping machines, milling machines and grinders is frequently more than doubled by the use of inexpensive Bellows "Controlled-Air" Power Devices.

These small, compact, versatile power feeding and holding units replace manual feeding and clamping . . . make standard hand fed and hand clamped machine tools fast automatic units—actually pay for themselves with the first few days of added production.

Bellows "Controlled-Air" Power Feeds have a "touch" as sensitive as the most skilled operator, feed work or tools hour after hour with the same uniform, precise feeding action. Bellows Air Vises, or fixtures operated by Bellows Air Motors, hold light or heavy parts in perfect safety, can be synchronized to open and close automatically with the movement of the machine.

If you're looking for ways to increase machine output quickly, investigate the use of Bellows "Controlled-Air" Power Devices.

Write

FOR FREE NEW FOTO FACTS FILE TODAY

Case histories, photographs, diagrams of Bellows installations which are increasing production from standard machine tools 50% to 500%. No cost, no obligation. Address:

THE BELLOWS CO.
222 W. Market St.
Akron, Ohio

The Bellows Co.
AKRON, OHIO

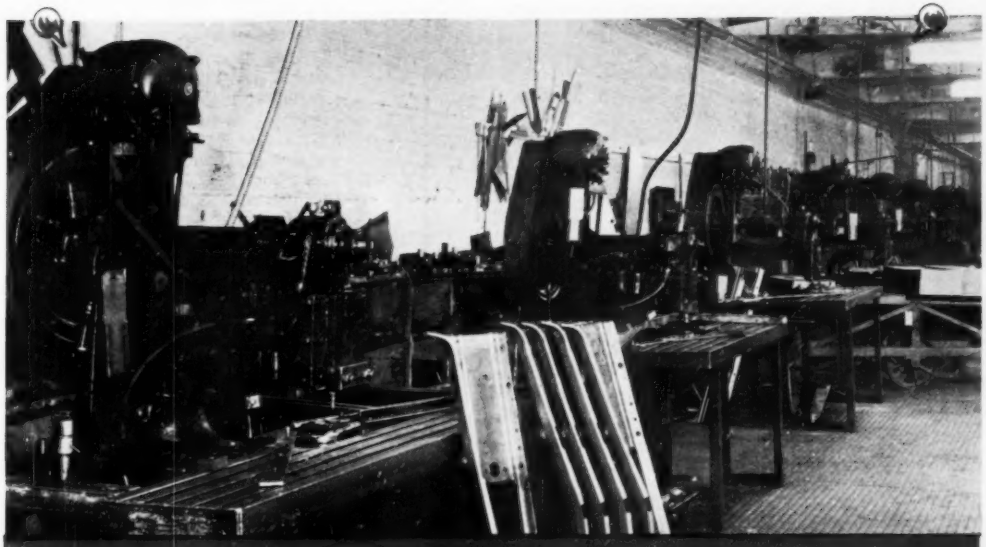
lecture and one 3-hr. lab. periods) throughout the senior year. Included are machining operations, welding, casting, forging, testing and inspecting. In addition, a 3-hr. course in metallography and heat-treatment is integrated with design and strength of materials courses, and preceded by a Ch.E. course in materials of engineering.

Georgia Institute of Technology—M.E. sophomores receive 9-hr. course in shop for one quarter, juniors a 6-hr. course, plus a 3-hr. course in heat-treating lab. For other engineering students, shop work has been reduced, but still have 0 to 6 hr.; for example, Textile Engineering students have no mechanical shop but do have work in their own labs in connection with operations of textile machinery. Also operate 5-year cooperative course, with alternate 3-mo. periods in industry and college. Prior to World War II, involved 800 students; now built back to several hundred.

University of Idaho—Shop courses recently expanded. Give courses in machine-tool work, welding, foundry, and pattern making. Also have elective courses in these subjects in which "students show a great deal of interest."

Illinois Institute of Technology (Consolidation of Armour Tech and Lewis Institute)—Require 1-semester machine-shop course for M.E., E.E., I.E., and Met. E., plus a 1-semester foundry and welding course for all E.E. and M.E. students before graduation.

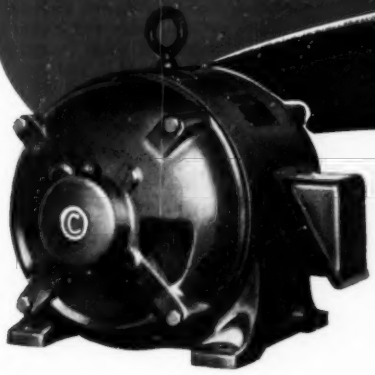
University of Illinois—Prof. Stillman Robinson started shop lab. courses in 1870, students in Machine Design designing a steam engine, for which patterns and castings were made and parts machined in the shops. This unit provided lab. power for 25 yr. Policy unchanged; M.E. students still take courses in metal casting, processing and heat-treatment. All courses combine theory and practice; foundry students design and make patterns, make bench and machine molds, cores, operate cupola and thus provide castings used in machine shop to produce a ½-hp. gasoline engine. Students work to standard times, punching time cards which are considered in grading. Have recently added a production option, including above courses plus Motion and Time Study, Production Control, Tool Engineering and Industrial Plant Design, all except Production Control requiring 3-hr. lab. periods.



The Correct Century MOTOR

Helps Keep Punch Presses on the Job-

✓ Maintain High Production at Low Operating Cost



Popular types and standard ratings are generally available from factory and branch office stocks.

The illustration above shows eight Century 1½ horsepower general purpose squirrel cage motors operating small punch presses. The operations performed on these presses are highly repetitive, with comparatively short intervals between strokes—and require a small amount of energy per stroke.

However, for large presses with heavy impact and comparatively long intervals between power strokes, Century offers high torque, high slip, squirrel cage motors. These type SCT motors smooth out the load curve; save wear on the presses.

Century builds a complete line of electric motors in a wide range of types and kinds, in sizes from 1/6 to 400 horsepower.

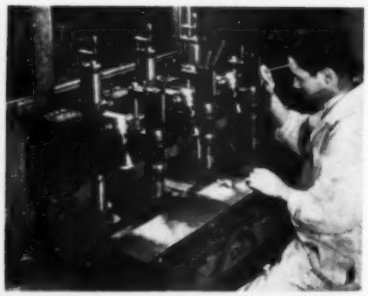
Specify Century motors for all your electric power requirements.

613

Century C MOTORS

CENTURY ELECTRIC CO. • 1806 Pine Street • St. Louis 3, Mo.

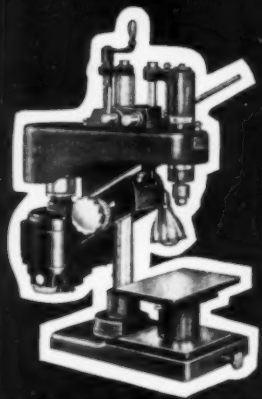
Offices and Stock Points in Principal Cities



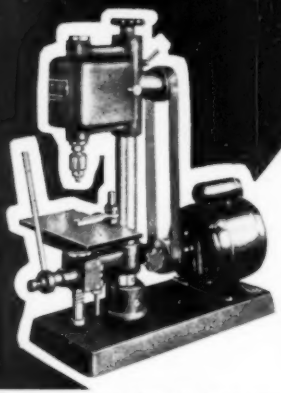
Note in the photo above how the tables butt to form a continuous work surface when machines are installed in batteries.

AT THIS POINT
YOU CAN SOLVE YOUR SMALL HOLE PROBLEM

If your job includes the drilling and tapping of small holes, with surgical precision and on tight production schedules, the two Hamilton precision tools shown here were built to meet your special need. They excel in fast, precision drilling and tapping of small holes in materials as diverse as paper and monel or ceramic and bronze. *And more* their flexibility, sensitivity, and stamina far exceeds the requirements of the average user.



Hamilton Varimatic, Super-Sensitive Drilling Machine. Infinitely variable speeds from 840 to 9300 R. P. M. Drills holes from .004" to 5/16".



Hamilton Super-Sensitive Tapping Machine. Patented power transmission. Tap idles in reverse and automatically changes direction of rotation when pressure is applied to feed lever. Released pressure again reverses spindle, reduces speed to "idle" and withdraws tap. Capacity from the smallest and finest tap to 10–32 inclusive.

For complete specifications and prices write today for our Varimatic Bulletin V-47 and our Tapper Bulletin T-47.

THE Hamilton TOOL COMPANY

SUPER-SENSITIVE DRILLING MACHINES · TAPPING MACHINES · POSITIONATORS

830 SO. NINTH STREET • HAMILTON • OHIO • U • S • A

Iowa State College—Many practical courses.

State University of Iowa—All M.E.'s have 5-hr. course in Manufacturing Processes, which includes machine tools, foundry and heat-treat; also a 2-hr. course in Production Methods and a course in Factory Management and Personnel Administration. Specialists in manufacturing can also take 8 hr. of specialties.

The Johns Hopkins University—No shop courses offered, but require 6 mo. of industrial experience for a degree (usually summer job).

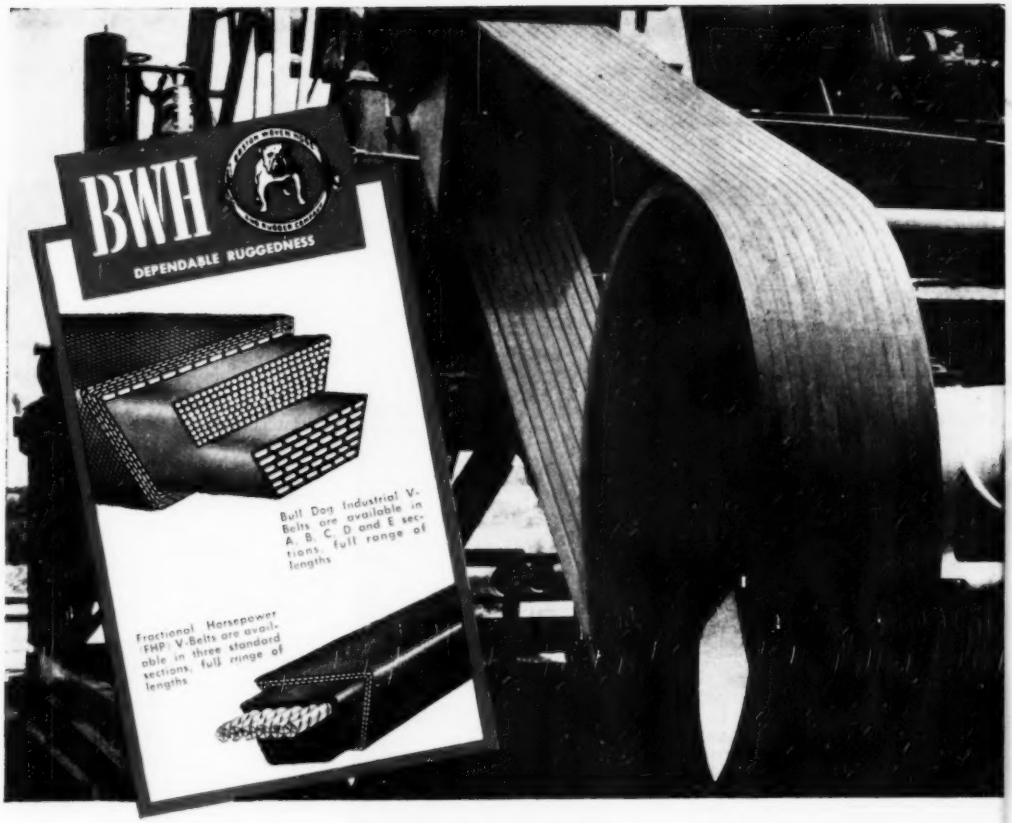
Lehigh University—Give 4-week summer course in machine-shop practice to I.E. and M.E. students after Freshman year. In other curricula, some experience with machine tools is obtained in regular lab. courses; for example, Ch.E. students are required to do certain work on lathe, drillpress, miller, etc., in adjacent shop. All engineering students required to have 8 weeks of industrial employment in summer after junior year.

Manhattan College—Plan to offer shop courses to E.E.'s as soon as space is available. No M.E. courses offered.

University of Maryland—Shop courses (since College Park branch was established in 1856) for all engineering students formerly included machine, pattern, forge and foundry shops. Pressure of other subjects now limits shop to M.E. and Aeronautical Engrg. students, 3 credit hr. (2-hr. lab.) in machine shop, 1 credit hr. in general methods of shaping materials.

University of Massachusetts—Engineering school established as separate entity Sept. 1, 1947. All M.E. & E.E. sophomores take 3-semester-hour course in machine shop, M.E.'s for two semesters, E.E.'s for one. C.E. students take none.

Mass. Institute of Technology—Total teaching load largest in history, with new staff members in both faculty and sub-faculty grades. Some 600 students receiving instruction in Metal Processing, and 600 in Machine Tool Laboratory. Metal Processing Lab. (part of Metallurgy Dept.) makes fundamental investigations in foundry, welding, hot and cold working, and powder metallurgy. Machine Tool Lab. (M.E. Dept.) also handles fundamental studies in metal cutting.


BWH
DEPENDABLE RUGGEDNESS
Bull Dog Industrial V-Belts are available in A, B, C, D and E sections, full range of lengths
Fractional Horsepower (FHP) V-Belts are available in three standard sections, full range of lengths

LESS SLIPPAGE! COOLER RUNNING! LONGER LASTING!

NO WONDER THERE'S INCREASING DEMAND FOR

RUGGED BULL DOG V-BELTS

On tough jobs where a dependable V-Belt drive is of utmost importance, operators today are specifying Bull Dog V-Belts.

These new BWH "titans" have consistently proved they deliver the kind of steady, trouble-free service that speeds production and slashes maintenance costs.

Here's why there's less slippage with Bull Dog V-Belts, fewer shutdowns for adjustments, greater long-term economy in their use:

1. *Exclusive Bull Dog Cord Section Has Higher Tensile Strength,* able to carry the load and absorb shock.

2. *Low Stretch,* because exclusive Bull Dog Cords are processed in a new way. As a result, there's less slippage, fewer adjustments, longer belt life.

3. *Cool Running,* thanks to quality-controlled compounds developed in BWH laboratories, which do not crack or deteriorate under the most severe flexing.

4. *Wear-Resistant Covers* of heavy, bias-cut fabric, to protect heart of belt from dirt, grease and moisture.

Bull Dog V-Belts are one of many famous products manufactured by BWH. When you need industrial rubber goods, look to BWH for products of dependable ruggedness, to BWH distributors for dependable service.

HAVE YOU A JOB WHERE STAMINA COUNTS?
Bring us your toughest problems. We're specialists in solving them. Consult your nearby BWH distributor or write us direct.

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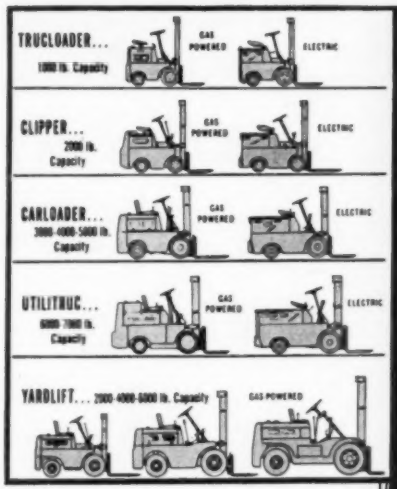
MATERIAL HANDLING News



GAS *and* ELECTRIC fork trucks

CLARK BUILDS BOTH

with maximum interchangeability of parts

a complete line ... capacities 1000 *to* 7000 lbs.

distinguished for LOW COSTS *of* operation *and* maintenance

More than 30 years ago, when Clark undertook to build Materials Handling equipment, it was with a conviction that it could evolve more economical handling methods, and build better machines to implement them. That those high objectives were quickly attained and have been continuously maintained is demonstrated by Clark's leadership in its field. Furthermore, users of Clark machines endorse them enthusiastically for those qualities of fine engineering and workmanship, and rugged dependability which Industry confidently expects from Clark.

Clark builds both gas-powered and electric battery-powered fork-lift trucks, with maximum interchangeability of parts between machines of equal size—a potent factor in production economies which liberally reward Clark users in the form of moderate initial cost, negligible maintenance costs and lower operating cost.

Above all, Clark's unique experience with both power-types permits unbiased analysis of your materials handling needs; and *makes it easy to determine from the facts* which type of machine will serve you most efficiently and economically

It's practical—and exceedingly "good business!"—to enjoy all these basic advantages: simply CONSULT CLARK.

Write for the current issue of "Material Handling News."

CLARK ELECTRIC AND GAS POWERED FORK TRUCKS AND INDUSTRIAL TOWING TRACTORS

INDUSTRIAL TRUCK DIV., CLARK EQUIPMENT COMPANY BATTLE CREEK 3, MICH.
REPRESENTATIVES IN PRINCIPAL CITIES THROUGHOUT THE WORLD
AUTHORIZED CLARK INDUSTRIAL TRUCK PARTS AND SERVICE STATIONS IN STRATEGIC LOCATIONS

Michigan State College—Course reproduces actual production methods. First-year men are machine operators, operate jigs, fixtures and machines. Second-year men act as foremen, setup men and inspectors. Upperclassmen represent top management as superintendent, layout, scheduling, etc. This permits three classes in shop at once, avoids jamming. Have added a course in sheet-metal manufacture; greater percentage of students in shop courses than ever before.

University of Michigan—". . . reasonable amount of instruction in shop courses, but do not feel that the amount should be increased."

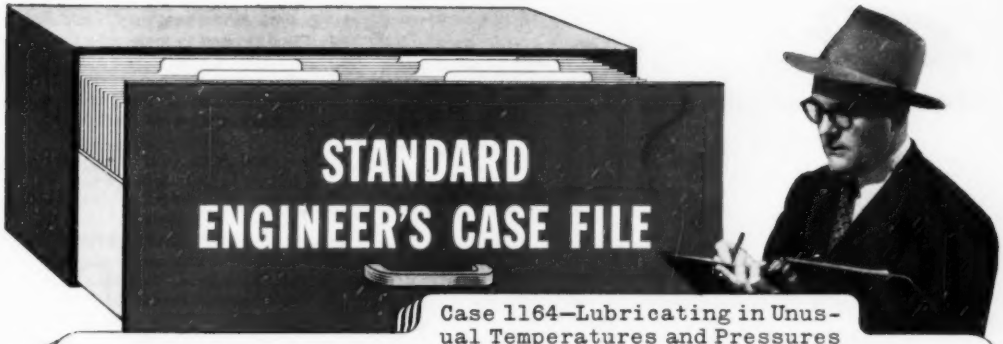
University of Minnesota—Seven "Materials and Processing" courses "Combine lectures and lab. work and attempt to cover both theory and practical uses of engineering materials and fabrication processes used in the field of mechanical engineering." Correlated with machine design, industrial management, refrigeration, materials testing, thermodynamics, etc.

University of Mississippi—No M.E. curriculum. Made major change in policy in 1947, shifting emphasis in three of four curricula to construction and production phases rather than design. These three curricula are C.E., Ch.E., and Engrg. Administration. (Fourth is Geological Engrg., combining geology and basic engrg.). Senior C.E. design courses replaced by construction estimating, construction plant, methods, foundation and earthworks, city planning, public utilities, graphical and mechanical computations. Student elects two options, one in Construction Engrg., one in Municipal Planning. Ch.E. options are Business Administration, Biochemical Engrg. (food & drug processing), as well as general technology. Engrg. Adm. options are Industrial Engrg. & Mgmt., Sales Mgmt., or Personnel Mgmt. . . . All these 4-yr. curricula require one summer in residence.

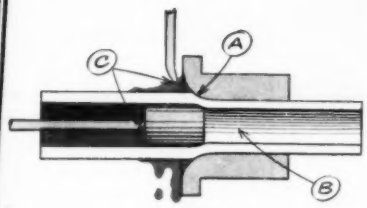
Alfred University (N.Y. State College of Ceramics)—Teach "silicate technology," and students follow plant practices in miniature; forming, firing and testing ceramic products.

Northeastern University—Cooperative plan.

University of Notre Dame—De-emphasizing shop work. Discontinued pattern-shop instruction two years ago, but now include some pattern



Case 1164—Lubricating in Unusual Temperatures and Pressures



DRAW-BENCH OPERATION

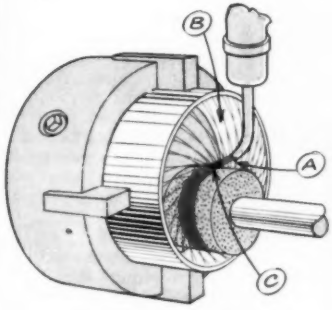
In a cold drawing operation on copper, specially-made Calol Alta-Vis Oils prevented any seizure between dies and work and eliminated degreasing. Lubricant left on work was completely consumed in annealing and left no stain. (These oils are "synthetic"—made by combining petroleum elements in a new form; eventually evaporate completely without leaving any residue.) Recommended for many metal forming operations, and as a carrier for graphite in the lubrication of glass mold cover hinges, kiln cars and other uses where ordinary oils gum and cake, and cause excessive wear and coking. Five grades: 50, 210, 530, 1060, 3060.

A. Resist extreme temperatures and pressures—crack at about 550° F.

B. Will not corrode any metal.

C. Flow freely and may be applied by oil can, grease gun or automatic pressure lube systems...good carriers for graphite.

Case 1151—Securing Efficient Cutting Oil Emulsions



WHEEL-GRINDING OPERATION

In a shop doing various kinds of metal machining, all emulsions of Calol Soluble Oil remained stable and retained their original efficiencies. Rusting was reduced to the minimum, work finish was excellent and tools remained in service for exceptionally long periods.

A. Contains balanced combination of oil-soluble emulsifier and water-soluble wetting agent, and special ingredient to speed emulsification—makes mixing easy and emulsion stable.

B. Cools, lubricates and flushes work and tool rapidly ...helps produce better work finish.

C. Defoaming agent minimizes formation of air bubbles.

Another product, Calol Soluble Oil HV, is generally used undiluted in hard service such as drawing and tube-bending operations. Its solubility allows easy decreasing of work with water.

For additional information and the name of your nearest Distributor, write

STANDARD OIL COMPANY OF CALIFORNIA

225 Bush Street, San Francisco 20, California

The California Oil Company
Barber, New Jersey

The California Company
17th and Stout Streets, Denver 1, Colo.

Standard Oil Company of Texas
El Paso, Texas

CALOL

Trademark Reg. U.S. Pat. Office

FROM
25-125
erratic threaded holes
per tap

TO
22,000
clean class 3 threaded
holes per tap

HERE'S HOW
HY-PRO DID IT...

PART: 18-8 stainless steel hex nut with *punched hole*

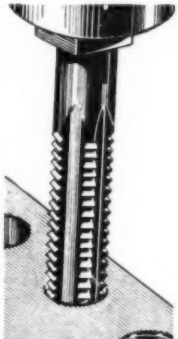
PROBLEM: Tapping with a 10-24 tap, a leading nut manufacturer experienced difficulty holding size and was troubled with excessive tap breakage.

Then They Called in the HY-PRO Sales Engineer

HY-PRO SOLUTION: His recommendation was a standard Hy-Pro 10-24 machine screw tap with one of the exclusive Hy-Pro surface treatments for wear and lubrication. Speed and cutting oil were adopted from extensive tables in Hy-Pro catalog. Production with Hy-Pro taps now averages 22,000 burr-free *Class 3* threaded holes at 62 nuts per minute.

Above is a typical example of how the Hy-Pro Sales Engineer can help increase threaded-hole production. His expert engineering counsel backed by the most up-to-date tap production methods combine to solve tapping problems rapidly and profitably.

All Hy-Pro Taps are ground from tough uniform quality high-speed steel and given one of the Hy-Pro exclusive surface treatments.



Each tap is completely inspected by the latest electronic quality control equipment, your assurance that there will be no dimensional variance in Hy-Pro Taps of a stated size.

These precision manufacturing methods plus the ability of the Hy-Pro Sales Engineer to prescribe the correct tap for your particular job means *sustained accuracy* on your production line resulting in higher productivity from your tapping machines.

℞ Let Hy-Pro solve your tapping problem—call a Hy-Pro Sales Engineer today.

Order from your distributor.

HY-PRO TAPS

HY-PRO TOOL CO.
NEW BEDFORD, MASSACHUSETTS
A SUBSIDIARY OF CONTINENTAL SCREW COMPANY

work in machine shop. Shop instruction revised to make effective use of $500,000 worth of war surplus tools. Have introduced an advanced (graduate) course in Machine Shop and organized a course in Tool Design.

Ohio State University—Shop required in Industrial (4 courses) Mechanical (4), Foundry (4), Welding (3), Aeronautical (1) and Electrical (1) Engineering curricula. Teaching staff of engineers only, most with M. Sc. degree. "Sections held down to a reasonable size, even though we must run day and night. We have no intention of dropping our courses."

Oklahoma A. & M. College—Shop course for M.E. just cut from 6 to 4 semester hours.

University of Oklahoma—One shop course (15 meetings) in first year combines lecture and lab. work (30-min. lecture, 2½-hr. lab.); for M.E. students includes some metallurgy. For M.E. and Industrial degrees, course includes pattern making and foundry; for C.E., Ch.E. and Petroleum Engrg, is acetylene and arc welding. E.E. and Met.E. freshman take welding or elementary machine shop. M.E. and Industrial students take a combination lecture-lab. course in second year and advanced machine shop in junior or senior year.

For advanced courses, teacher acts as contractor who agrees to deliver so many parts per month for so much. Students have an interest in the firm; contract price is based on 85% of maximum grade.

Oregon State College—Teach shop work in a "reasonably modern and well-organized program." Have "Industrial Administration" course that fits between vocational training and professional engineering, requiring extensive shops also available to professional engineering divisions as required.

Pennsylvania State College—Continue to require shop lab. courses in several curricula, but not of the "manual training" type. Emphasis on study of processes, production methods and relationship of shop work to properties of materials.

University of Pennsylvania—Have not reduced machine-shop instruction.

Pratt Institute—Entered engineering-degree field ten years ago; formerly gave only institute training. Considerable shop equip-

Your Source of Supply for Better Taps

There are many sources of supply for standard taps . . . also varied degrees of quality in manufacture. The only way to determine *your* best source is by (1) reputation of the manufacturer in the trade, (2) your on-the-job performance of the taps you buy on the basis of tapping cost per hole.

However, if you run into troubles, it is far better practice to consult *your* manufacturer, stating the trouble in detail and requesting a solution. Hanson-Whitney engineers welcome such inquiries . . . in fact, we request them. We stand firmly back of Hanson "Finished Taps" of both Standard and Special make.

And as for "Specials," you'll find no *better* source of supply anywhere.

Measurement of Tapping Costs

Economy of tapping is measured only by the cost per tapped hole . . . not by the cost of the taps themselves.

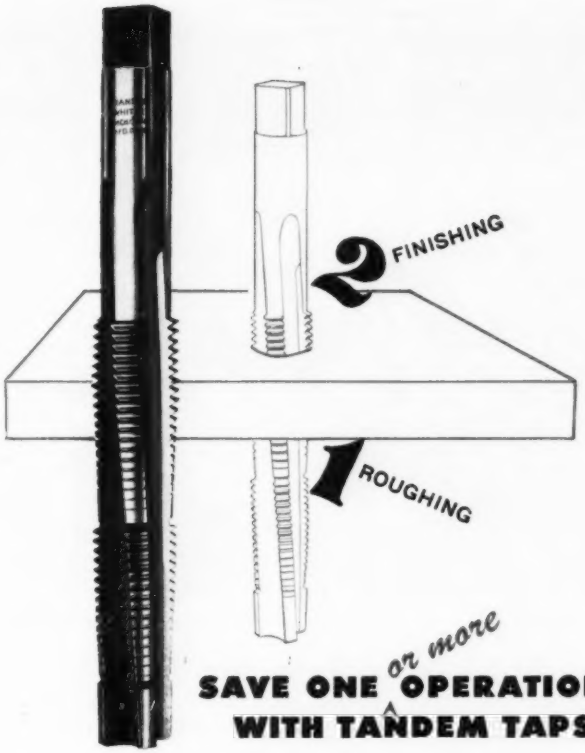
In high speed tapping the Hanson-Whitney "Finished Taps" clearly demonstrate their superior value both for accuracy and economy. The accuracy with which they are made results in long tap life, minimum breakage, and perfect threads. It naturally follows that they are the most economical to use.

Explain Your Job in Detail . . . We'll Serve You Better

When ordering, specify grade of material to be tapped, depth of tapped hole, class of fit and whether through hole or bottoming. With full information we can give you correct hook or rake on cutting faces, number and style of flutes and proper chamfer. Thus you obtain the right tap for the specific operation . . . lower costs, quality threads.

2HW49

(advertisement)



SAVE ONE or more OPERATIONS WITH TANDEM TAPS

A Hanson-Whitney "Tandem Tap" embraces two distinct sections . . . the lower one for roughing, the upper for finishing . . . both sections being uniform in lead, providing added chip space, better lubrication to the roughing section.

This type is recommended only where conditions permit both sections to pass through the work . . . and preferably where the tap can be removed, without reversing.

If you have difficult tapping problems, steep leads, long threads . . . and if superior finish is essential, the results cannot be excelled. Moreover, this "Tandem Tap" will produce in *one* operation what generally requires *several* taps . . . a decided cost saving in production tapping. Available in any form of thread or limits.

HANSON-WHITNEY MACHINE CO. HARTFORD 2, CONN.
Division of Whitney-Hanson Industries, Inc.

For practical recommendations submit your problems to Hanson-Whitney engineers.

Hanson Whitney

PIONEERS OF FINISHED TAPS

OUT OUR WAY
OUR PRODUCT GLOWS IN THE DARK! IT'S SENSATIONAL!
YOU GUYS ARE WASTIN' YOUR TIME! I USE SOL-SPEEDI-DRI BECAUSE IT COVERS MORE, ABSORBS MORE, COSTS LESS TO USE!
THE PRODUCT I SELL CRACKLES AND POPS--KEEPS EVERYBODY ON THE JOB WIDE AWAKE!
"GLOWS IN THE DARK--CRACKLES AND POPS!" THEY'VE GOT TO HAVE SOMETHING TO SAY--'CAUSE THEY CAN'T MATCH THE NEW IMPROVED SOL-SPEEDI-DRI!
YEH, CLAIMS NEVER DID DO SO GOOD AGAINST FACTS! AND THE OL' MAN'S GOT THE FACTS ABOUT SOL-SPEEDI-DRI!
HIGH PRESSURE
J.R. WILLIAMS

You Can't Beat the Facts!

New improved *SOL-SPEEDI-DRI* gives you *more volume* per pound.

New improved *SOL-SPEEDI-DRI* *covers more* floor area per pound.

New improved *SOL-SPEEDI-DRI* *absorbs more* liquids per pound.

YES, the new improved Sol-Speedi-Dri is more economical to use, because you get more bulk, more coverage, more absorption per pound.

★

Safety & Maintenance Co., Inc., 1 Wall Street, New York 5, N.Y.

Warehouse stocks maintained in principal cities of the United States and Canada.

ment, used both for students and for training of adults in evening institute program. Shops also used for laboratories for courses in time and motion study, design exercises and other upperclass work, as well as training of freshmen and sophomores in basic production processes. Regular instructors all engineering graduates with industrial experience and considerable shop skill, rather than former highly skilled mechanics. Evening instructors (for institute work) all skilled mechanics. Regular teachers have assignments in production theory and design, to pull these subjects into line with shop training.

Princeton University — Requires one sophomore course in Machine Shop practice for M.E. and General Engineering. Course is two lectures and a 3-hr. lab. each week. Also a graduate course in Manufacturing Methods, taught by a shop expert, available to senior M.E. students. Sophomore course now open to A.B. students also, who take it for "hobby" or other reasons.

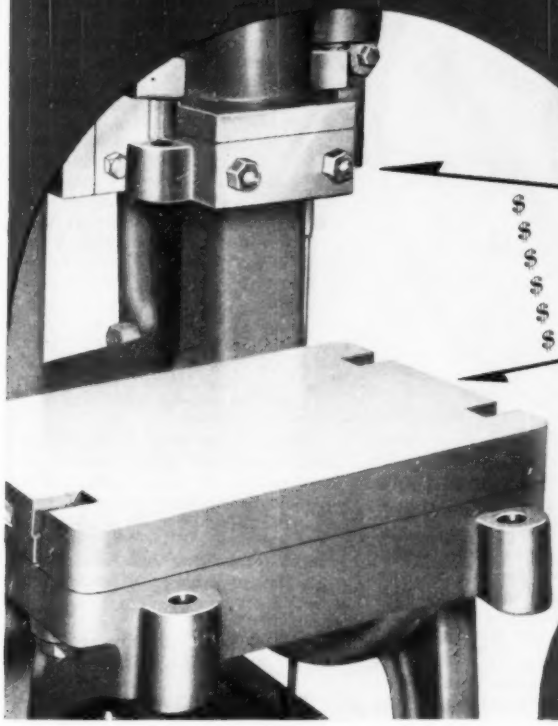
Purdue University — Civil and Chemical Engineers take a 1-semester course in "Manufacturing Processes," M.E., E.E., and I.E. more extensive courses. While given in what are called "machine process laboratories," they are still shop courses.

Rhode Island State College—"R.I. State is in an area in which the machine-tool industry stays a prominent part, so it has always seemed advisable here to devote a fair amount of the curriculum in Mechanical Engineering to shop-work training . . . We have followed a middle-of-the-road policy."

Rutgers University—"We expect to give a one-semester course in Metal Processing during which students will have an opportunity to learn something about the limitations of the various tools. It is certainly not our intention to train machinists. Our primary purpose is to give broad basic education . . . which will form a good foundation for continued study after graduation . . . "

South Dakota State College — "Shop courses in welding and machine work are an important part of our engineering curriculum . . . courses have undergone many changes to fit in with modern equipment and later developments in production. We do not expect to make machinists . . . Shop work gives a student a chance to relax from his classroom activities, do some physi-

Johnson INCLINABLE POWER PRESSES GIVE YOU 3 TO 8 INCHES MORE IN THE "EARNING SPACE"

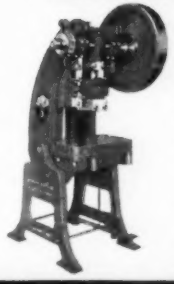


from HERE to HERE

BETWEEN the bed and the gibs, in the depth of the standard stroke, you can spot the earning capacity of a power press. Every standard Johnson model has an advantage over other presses in this respect. In addition to this, Johnson's frame-casting method permits lengthening of the stroke in one-inch increments on special custom-built presses at negligible cost.

YOUR DIE DOLLAR brings a greater return when production is scheduled on a Johnson press. Check the dimensions of competing units, and you'll see Johnson gives you more die space on smaller presses, even though the standard bolster plate is thicker. This advantage is greatest in the Models 1, 2, and 4½.

WITH JOHNSON *INCLINABLES* on the floor, a plant can handle bigger jobs with a small investment in original equipment and lower operating costs. We can send you figures to support purchasing recommendations on open back inclinable power presses of 16 to 90 ton capacity.



EXTRA SAFETY makes Johnson a better buy. Exclusive patented Non-Repeating Safety Clutch prevents accidents and protects dies. Mechanism is activated by two springs. If one breaks, the other holds clutch disengaged. If both should break, clutch automatically disengages. It takes 30 seconds to replace springs —without stopping machine.

RUGGEDLY BUILT

Johnson presses have extra gib adjusting bolts on side of frame, extra front anchor bolts . . . and bigger ones . . . for longer service on heavy work without loss of precision.

Write **or call Johnson for specifications on six models of inclinable power presses now being offered. Tell us what materials you work, how you form them. Chances are a Johnson can do a better job.**

Johnson MACHINE and PRESS CORP.

639 WEST INDIANA AVENUE • ELKHART, INDIANA

A
B
C
D
HOW MANY can you identify ?
Do you recognize these HOLTITE fastenings? Guess what industry uses each of them. Check yourself by the list below.

CONTINENTAL makes them all and thousands more

Of all the 400,000 varieties of fastenings that literally hold our industries together, Continental makes a large proportion marketed under the famous HOLTITE trade name. Most of them are standard — screws, nuts, and bolts for every use in every industry. Others like the well-known HOLTITE-Sems and HOLTITE-Phillips screws are patented specialties and the famous HOLTITE-Thredlock, Locktite and Tap screws were first designed and produced by Continental. Sometimes a fastening engineered by HOLTITE for one industry finds an unexpected use in another. Often a HOLTITE-*Engineered* fastening will replace several parts that a manufacturer is using. Why not discuss your fastening requirements with a Continental Sales-Engineer. He will focus on your requirements all the broad industrial-fastening experience and ingenuity of Continental. Remember Continental is constantly improving HOLTITE products, lowering their cost and broadening service.

ENGINEERED FASTENINGS FOR PRODUCT ENGINEERS

A. A typical flat head HOLTITE steel woodscrew. Continental makes a complete range of sizes with either slotted or Phillips heads.

B. Special Phillips "HOLTITE-Thredlock" door hinge screw eliminates lock washers and other locking devices giving improved performance when subjected to vibration.

C. Dial adjusting screw specially designed for bathroom scales. Screw inserted in frame is swaged against square shoulder under head. Completed part engages scale leveling mechanism to allow screw driver adjustment.

D. Beater drive shaft for a home electric mixer. Continental engineered this unusual part and produced it economically by cold heading process. Head end is welded to the beater unit. Knurled section provides grip for motor chuck.

This Trademark HOLTITE T. M. REG. U. S. PAT. OFF. *means made by —*

CONTINENTAL SCREW COMPANY

1904 1949

NEW BEDFORD, MASS., U.S.A.

cal work and get his hands dirty . . ."

Southern Methodist University—Cooperative plan, supplemented by a basic shop for training in fundamentals and lectures with sound motion pictures.

Stanford University—M.E. Dept. "firmly believes in shop courses in which each student is required to gain manual acquaintance rather than professional skill with numerous basic manufacturing operations." Forge and heat-treating, plus all types of welding, are taught in one course. Foundry (all types) is taught in a second. In machine shop, all students in turn operate all basic machines, have more involved ones demonstrated, can operate them themselves in a more advanced second course. All shops offer advanced courses.

Agricultural & Mechanical College of Texas—". . . we are not so shortsighted as to be included . . ." among colleges abandoning shop courses.

University of Toledo—Require all engineering undergraduates to take two courses in machine shop, even C.E. majors. More advanced machine-shop courses, and in foundry and welding, are elective for M.E. majors. Give one hour of lecture, 2½ hr. of laboratory work each week.

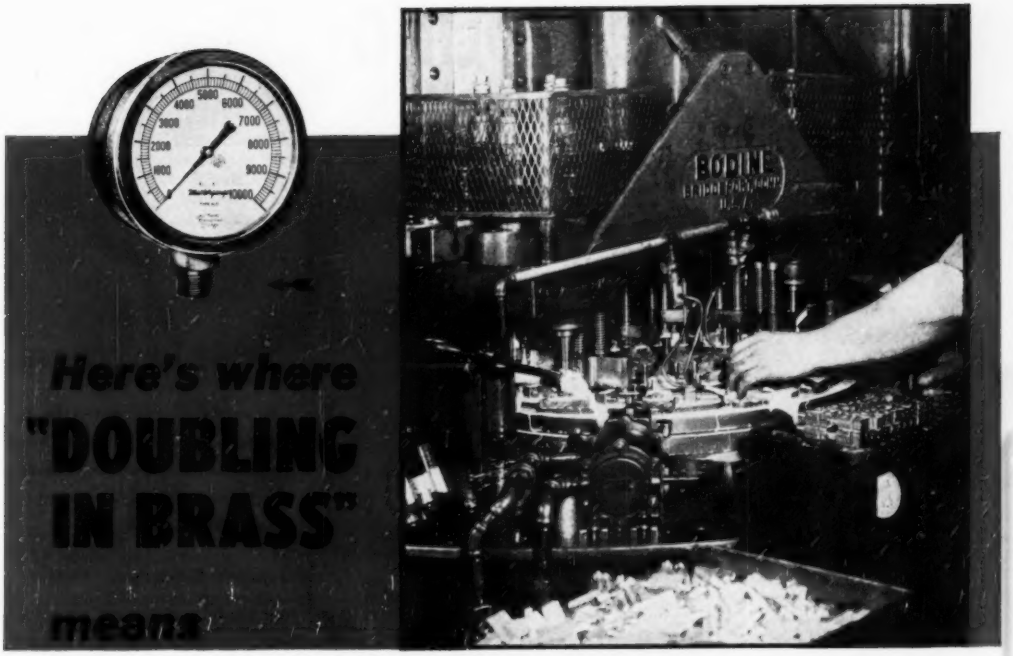
Tufts College—Strongly favor shop work, even for Ch.E. students.

University of Utah—Offset instructors lacking in shop experience by bringing in special lectures from industry. Shop course designed to develop a knowledge of methods and materials, not skill; hence "lecture work given with all shop courses, although most of the time is devoted to actual experience in the shops."

State College of Washington—"We certainly haven't abandoned our shop-laboratory courses and have no plans to do so in the future."

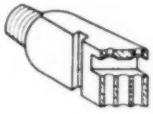
Wayne University—Have full shop courses, which give "basic shop knowledge and skill much faster than is usually done in industry."

West Virginia University—Have reduced time in shop courses, cutting out woodworking and foundry, but have added fusion welding. Reduced machine-shop work only moderately. "Although time devoted to this work has been reduced, we are utilizing this reduced time much more effec-



DOUBLING OUTPUT... or more

...and when we say "doubling" we are extremely conservative. In this case 8 different holes were drilled . . . 2 also countersunk . . . in a Brass Gauge Socket. Production 700 pieces per hour from the machine, 5600 operations per 50 minute hour.



Brass Gauge Socket

Bodine automatic Drilling, Milling, Tapping and Screw Inserting machines cut costs almost unbelievably. We have one report of up to $200.00 savings per day on each machine of a battery . . . truly a worthwhile investment.

If you need repetitive production of small parts you need to know about Bodine multi-spindle automatics. Send for a Bodine Bulletin today . . . it pictures modern production at its best.

"You can't meet
Tomorrow's Competition
with Yesterday's Machine Tools."

THE
Bodine
CORPORATION
BRIDGEPORT 5, CONNECTICUT
AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

Z BD 49

NEEDLESS HANDLING

Here's 3 ways to stop it!

SYSTEM For volume movements of manufactured parts, packaged items, tote pans, etc., use a complete conveyor system. Standard Conveyor Systems can be designed to meet your individual needs . . . with belts, wheels, rollers or chutes complete or in combinations as needed. You can conveyorize a department or a complete plant from raw stock receiving to final shipping.

SECTION If your problem is handling parts or packages within a department, you can buy small sections of roller or wheel conveyors that are easily transported and set up where needed. This is ideal for loading docks, warehouses, shipping platforms and stock rooms. Saves time and labor, minimizes damage from excess and rough handling. Use gravity for power.

UNIT Portable powered units, like the Standard Handi-Belt shown here are a real time and labor saver. They handle boxes, bags, cases and small bales with equal facility. Reversible power drive permits higher stacking and handling in warehouses. Makes for faster unloading and loading in trucks or cars. Can be used in confined space. Plug-in any local outlet.

For detailed information on any one or all three, write for Standard's Catalog. See how conveyors can be used in your business. Ask for Bulletin No. AM-49.

STANDARD CONVEYOR COMPANY

General Offices: North St. Paul 9, Minn. • *Sales and Service in Principal Cities*

FREE HELPFUL LITERATURE

Send for Standard's Catalog. See how conveyors are used in every field of industry. Ask for Bulletin No. AM-49

Standard

GRAVITY & POWER CONVEYORS

tively because of much better organization of the work."

University of Wisconsin — Have eliminated courses in pattern making and certain required courses in advanced shop work. M.E. students still have required courses in machine shop, foundry, welding, machine testing, manufacturing and production methods and many electives. Less for other engineers.

Yale University—No shop courses

College Shop Equipment

A partial survey, based on information in over 60 letters from deans and professors of engineering commenting on the articles on pages 85-91 of this issue

Alabama Polytechnic Institute — Three interconnected buildings, each 60 x 140 ft. (total 33,600 sq. ft.) with $200,000 worth of modern equipment, plus $30,000 worth of equipment in a U.S. Navy gage laboratory, which also is a checking station for precision measurements of Naval Ordnance material, 8th Naval District. Now equipping a new foundry to replace one dismantled early in World War II and will re-establish a Foundry Practice course.

University of Arizona—Numerous engine lathes, two turret lathes, numerous drillpresses, several shapers and millers, a Do-All saw, internal, surface and tool grinders, threader, various hardness and strength-testing machines, gas and electric welding units, heat-treating furnace, power hammer, power press, etc.

Brooklyn Polytechnic Institute—Full equipment in machine shop, foundry, casting, welding, etc.

University of Buffalo—Demonstration units from war surplus, operated by an expert mechanic. Supplement with shop films and typical parts.

University of Florida—Mfg. Operations Lab. have modern equipment; all instructors have industrial experience.

Georgia Institute of Technology—"Well equipped and comparatively modern pattern shop, machine shop,

Preventing END BEARING OF GEAR TEETH...

- increases their factor of safety
- reduces gear noise
- and prolongs service life

Conventional gear teeth (spur or helical) can be expected to behave as they should theoretically only on the drafting board. When they are made of steel and assembled in a power unit, it is a rare accident when bearing is uniform across the entire faces of any two mating teeth. In nearly every case bearing is concentrated at one end of the tooth or the other where it is most vulnerable to failure.

The remedy is the Elliptoid Tooth Form, engineered and produced by Red Ring engineers 12 years ago. The Elliptoid Tooth Form positively prevents end bearing as demonstrated by actual experience in hundreds of applications.

One nationally known manufacturer of trucks and tractors received frequent complaints of gear tooth failures until he adopted the Elliptoid Tooth Form. Since then such complaints have practically vanished. Elliptoid transmission gears tested by this manufacturer for 125 hours under a load of 140 foot pounds and then for an additional 125 hours at 180 foot pounds showed no harmful effects.

Another top ranking tractor manufacturer says the service life of his Elliptoid gears is 30 times greater than that of previous conventional gears. Elliptoid gears are produced on Red Ring Gear Shaving Machines.

Send for descriptive literature.

NATIONAL BROACH AND MACHINE CO.

3600 ST. JEAN • • • • • • • • • DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

NEW AUTOMATIC DIE FEEDS PAY FOR THEMSELVES OUT OF LABOR SAVED!

The average hand operator can produce a maximum of 2,000 pieces per hour, or only 16,000 pieces in an eight-hour day. The same hand-fed press, equipped with scientifically accurate automatic Die Feeds will produce 48,000 pieces in that same period when operating on a basis of only 83% efficiency.

Figuring an operator's time at $1.25 an hour it will be seen that this increased output results in an actual saving of $20.00 per day. Equally important, but frequently overlooked, is the fact that Automatic Die Feeds can operate successfully for long periods unattended, thereby permitting the operator to attend to other duties. Dickerman Die Feeds are meeting with instant approval in shops from coast to coast.

DICKERMAN AUTOMATIC DIE FEEDS *Increase Production* 300% OVER HAND FEEDING

While Reducing Operator's Time by as Much as 90%

The above FACTS have been substantiated by innumerable progressive manufacturers who have installed these PROFIT PRODUCING Die Feeds.

DICKERMAN DIE FEEDS are exceptionally accurate . . . may be attached to ANY punch press to feed Steel, Copper, Brass, Paper, etc., from any angle. Rugged construction, with no wearing parts, assures exceptionally long life. Replace your worn feeds AT ONCE. Avoid costly jams and crack-ups. DICKERMAN FEEDS *Pay For Themselves* in less than a month.

Catalog and Complete Detailed Information { *Free!*

H. E. DICKERMAN MFG. CO.
319-414 ALBANY ST
SPRINGFIELD MASSACHUSETTS

welding shop, heat-treating shop and a rather inadequate foundry." Have a considerable quantity of government surplus material.

University of Idaho—"Very well-equipped machine-tool laboratory," also welding, foundry, and pattern-shop equipment.

Illinois Institute of Technology—"Frankly . . . our machine shop is more modern than most industrial organizations." 20 engine lathes, all individually motored, most of them about 1 yr. old—the oldest not more than 5 yr. Also other equipment, such as milling machines, drillpresses, grinders, etc.

University of Illinois—Shop started by Prof. Stillman Robinson, who had served his machinist apprenticeship, shortly after he became head of Dept. of M.E. in Jan. 1870. With $2000, he bought hand and machine tools, plus equipment for a small foundry. Now have up-to-date machine tools, jigs, fixtures and tools to produce a ½-hp. gasoline engine. Got 100 machine tools and much equipment for foundry and heat-treatment labs. from government surplus. New M.E. Building will be ready in June to include all shop labs. and a Metal Cutting Laboratory for use of graduate students.

State University of Iowa—Obtained enough surplus tools practically to replace all lab. machine tools and to add types not previously owned. Found small lathes difficult to obtain for teaching labs.

University of Mass.—Veteran's branch at Fort Devens has "very fine machine shop," largely from war surplus, which will be moved to campus when branch closes in June, 1949.

Mass. Institute of Technology—New equipment in Machine Tool and Metal Processing Labs., plus the new Boston Gage Lab. New million-dollar lab. building at top of priority list.

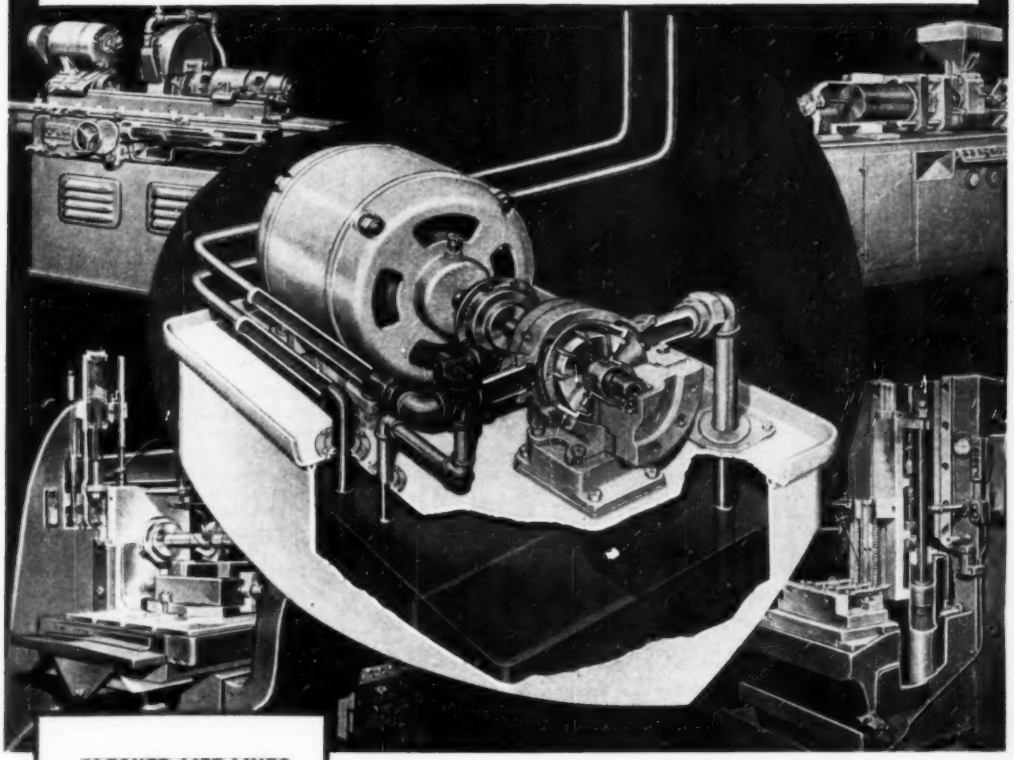
Michigan State College—". . . have taken advantage of war surplus and have now an excellent quota of shops and equipment with bus-bar electrical system allowing us to move machines to new layouts almost at will."

University of Mississippi—No M.E. course. For C.E., Ch.E. & Engrg. Administration, shop facilities are limited, but being expanded.

New York University—All belt-

STOP "BLOOD CLOTS"

WITH THE WORLD'S GREATEST LUBRICATION KNOWLEDGE



CLEANER LIFE-LINES FOR YOUR MACHINES!

Famous Socony-Vacuum Hydraulic Oils Again Improved

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Backed by Skilled Engineering Service

★

For GREATER OUTPUT Rely on the BEST!

From now on, the "heart" of your hydraulic machines—the oil pump—will be able to push new "blood" into machine life-lines. Famous Gargoyle D.T.E. Oils—the oils that have set hydraulic performance standards for years—have been *still further improved* to protect against oxidation deposits (blood clots), rust and wear. They're available now in volume, backed by our 83 years' lubrication experience and skilled engineering service. Put them to work for longer machine life, more continuous production.

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GARGOYLE Lubricants

SOCONY-VACUUM OIL CO., INC.
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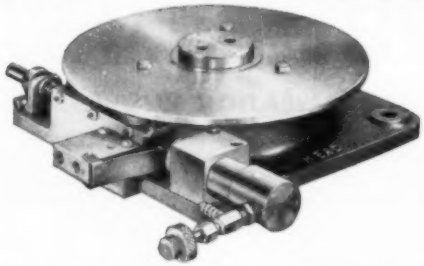
GENERAL PETROLEUM CORPORATION

Rely on **SOCONY-VACUUM** *Correct Lubrication*

Air Operated

ROTARY WORK FEEDER



Deftly holds and delivers small parts to drill, tap, swage, stake, etc. Stations accurate to .002". Guaranteed against over-travel or "skipping." Indexes as slow or fast as you like, up to 10,000 per hour. Compact and sturdy, easy to tool and hook up.

Standard dial plate 10"; available in 12". For a new job, simply tool up a new dial. Readily combines with "MEADMATIC" Timer, Air Hammer, Air Press, Drill presses, etc.—to make almost completely automatic machine—operator merely loads.

Write for full details.

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Small Investment Does a BIG JOB

Why cut off metals on big, high priced equipment? This low cost band saw does the same jobs with time and labor saving speed and accuracy. Capacity 8" x 16". Coolant Model (illustrated) permits continuous production. Cuts round, square or odd shapes, single or in gangs.

Used in thousands of modern plants. See your dealer or ask for bulletin.

KALAMAZOO Metal Cutting BAND SAW

MACHINE TOOL DIVISION

KALAMAZOO TANK & SILO CO., Kalamazoo 16, Michigan

Exclusive Export Distributor

American Steel Expart Co., New York City

driven machines replaced by "fairly up-to-date equipment."

University of Notre Dame—During the last two years, machine-tool lab. modernized by half a million dollars worth of modern tools from war surplus.

Ohio State University—Have 150 tools in machine shop, not one belt driven, and average age about 8 years. Also have welding and heat-treating lab., foundry and $50,000 gage lab.

Oklahoma A. & M. College—Pattern shop with 20 benches, 17 lathes; foundry with home-built cupola, brass and aluminum furnaces, no molding machines, 16 arc welders, 16 acetylene sets, a 76x90-ft. machine shop with tool rooms, stock room, etc. Equipped with much war surplus: 20 lathes, 2 turret lathes, 6 millers, 3 auto-screw machines, 3 surface grinders, Do-All machine, many drills, broach, thread grinder, centerless grinder, gear shaper and gear hobber.

Oklahoma Institute of Technology—Have obtained a great deal of war surplus; a considerable amount of which is in excellent condition and fairly new, now setting up, subject to limitations in people and funds. Also obtained one or more large units for occasional demonstration.

University of Oklahoma—Modern shops, with fluorescent lighting, monorails, wood-block flooring, etc.

Oregon State College—Recently renovated entire shop at a cost of $76,000 and have modernized equipment with surplus at the same time. "We now believe that we have one of the better school shops on the Coast." Have a production line.

University of Pennsylvania—" . . . made considerable progress in modernizing machine-shop practice instructional equipment during recent years . . ."

Pratt Institute — Now spending $20,000 on expansion and modernization of shops. 3630-sq. ft. machine-tool lab. includes 29 engine lathes, 4 drillpresses, 9 grinders, 3 bench lathes, 2 screw machines, 5 millers, planer, punch press, 4 shapers, shear brake, tool crib with necessary small tools. Also a 600-sq. ft. gage lab., 1820-sq. ft. patternmaking lab., 2750-sq. ft. heat-treating and welding lab., and 5000-sq. ft. metal-casting lab., all well equipped.

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FABRICATED ALLOYS

Now...

One Piece Sand Seal Rings

Of Inconel

This new Rolock construction of sand seals eliminates all radial welds and makes them integral with the body of your Homo-Carb furnace retort . . . facilitating installation and maintenance.

Inconel Retort with one piece integral Sand Seal

The One Piece seal insures perfect fit, which means sound, full penetration, gas-tight welds . . . the weld metal having the same strength and resistance to high heat and corrosion as the parent metal itself. Rolock Inconel retorts prevent atmosphere leakage . . . lengthen life of electric heating elements . . . do away with bulging or sagging.

If you've been troubled by embrittlement from carburizing or gas cyaniding atmospheres . . . and you want to cut heating costs, improve work, specify Rolock Inconel Retorts with the new *One Piece* integral Sand Seal . . . for original or replacement equipment.

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JOB-ENGINEERED for better work
Easier Operation, Lower Cost

COMPLETELY **NEW**
CASE HARDENING PROCESS

Carburit

ULTRA RAPID PACK HARDENING PASTE

HIGH RAPIDITY OF PENETRATION
.040" in 25 to 30 Minutes

SOLVES PROBLEM OF SELECTIVE HARDENING
By applying only to desired sections

NO SPECIAL FURNACES OR EQUIPMENT NEEDED
—even an open fire will suffice

ENORMOUS TIME SAVING
— repair units can be hardened right in maintenance shop. No special training required

CARBURIT IS NON-TOXIC

Isopac

ISOLATING PASTE

KEEPS DESIRED SECTIONS SOFT

While rest of workpiece is being hardened

REPLACES COPPER PLATING—
and other expensive methods.

JUST PUT ON AND KNOCK OFF
Saves time, money.

PREVENTS PENETRATION OF CARBON AND SLOWS DOWN COOLING OF COVERED SECTION.

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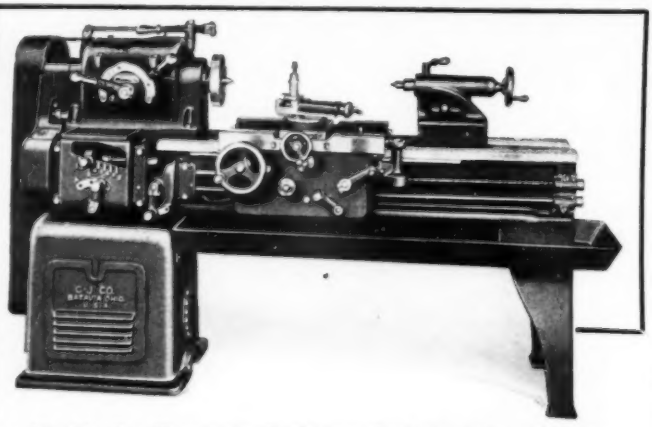


C. & J. Geared Head LATHE 16 INCH 12 SPEED

● Designed for high quality general service. Built in one size and one model only. Powerful, accurate, tooled and equipped to produce efficiently. Features exceptionally long carriage bearing (23⅜"). Feed is provided by separate rod, so lead screw is used only for thread chasing. Complete regular equipment includes thread indicator. Guaranteed accurate within .001 inch in 14 inches. *Write for new descriptive bulletin 38-A-8.*

CARROLL & JAMIESON MACHINE TOOL CO.
BATAVIA, OHIO

Gage lab. has eight 24 x 60-in. benches and two 24 x 18-in. benches; can handle 24 students at once. Equipment includes 2 optical projectors, several comparators, 2 supermicrometers, angle plates and complete hand inspection equipment.

Casting lab. has six molding benches, 3 molding machines, core oven, sand blender, sand blast, snagger, cupola, 30-k2. induction furnace (30-16 melt), sand rammers, testing machines, 78 flasks up to 12 x 24 x 48 in., etc.

Pattern lab. can handle 16 students at one time; has drillpress, grinder, 2 jointers, 12 wood lathes, surfacer, 2 bandsaws, spindle sander and disk sander.

Heat-treating lab. has radiograph and oxygraph cutting machines, spot welder, 4 arc welders, 3 pot furnaces, muffle furnace, oven furnace, 3 electric furnaces, 4 hardness testers, Magnaflux machine, 30-kw. induction-heating unit, hacksaw, 3 grinders, 5 oxyacetylene sets, and 8 sets hand forging tools.

Princeton University—All old machine tools replaced but one; considerable addition from war surplus.

Purdue University — Completing $250,000 renovation of Michael Golden Shops, with special floors, fluorescent lighting and color painting. Installing 200 or more machine tools, etc., on isolating bases. Most tools from surplus (about $2 million worth), all individually motored. Also demonstration turntable, $50,000 Navy Gage Lab., etc., plus maintenance shops.

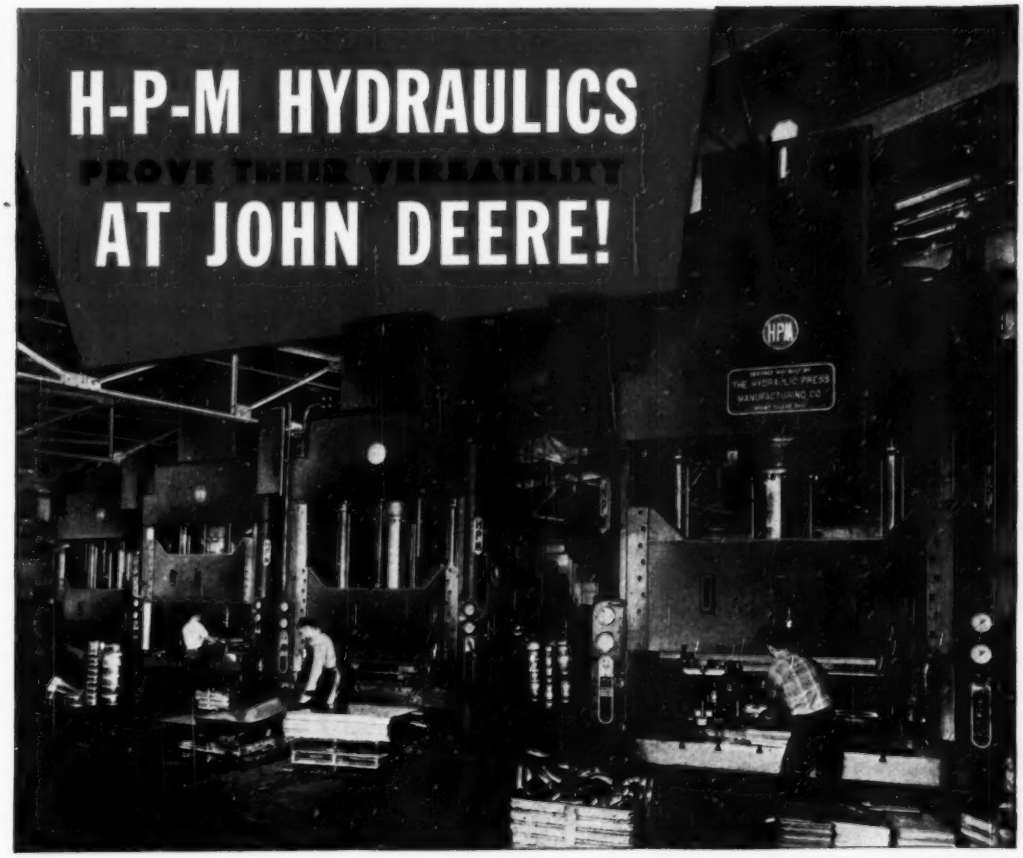
Rutgers University—"Now setting up a new Metal Procesing Laboratory which will contain a good assortment of the most modern machine tools, mostly . . . from war surplus."

South Dakota State College — "Much of our equipment is outdated. We have however modernized some machines and also secured many new ones from War Assets."

Southern Methodist University—"Certainly, no school can afford to be up-to-date in its machine-tool laboratory. We try to maintain a shop where students can get some experience in the use, care and maintenance of various machines, such as drillpresses, lathes, shapers and grinders." (Cooperative plan)

Stanford University—Have foundry, forge, heat-treat, welding and

H-P-M HYDRAULICS
PROVE THEIR VERSATILITY
AT JOHN DEERE!



HERE'S HOW! Six big H-P-M presses at John Deere's Dubuque Tractor Works are making short runs pay off. As many as 4 operations per cycle with progressive dies speed up production of small parts. Scrap loss is less than 1%! Yes, these all-hydraulic units are really versatile . . . 52 different tractor parts requiring 96 operations are all handled on H-P-Ms.

With H-P-Ms you get . . . deeper draws, quicker die set up, fewer operations, less rejects, absolute control over pressures, speeds and strokes plus a fast cycle.

Call in a nearby H-P-M engineer to explain these money saving features and you'll agree H-P-Ms are the best buy.

Write for your free copy of TOOL & DIE JOURNAL's *informative article, "Why Hydraulic Presses?"*

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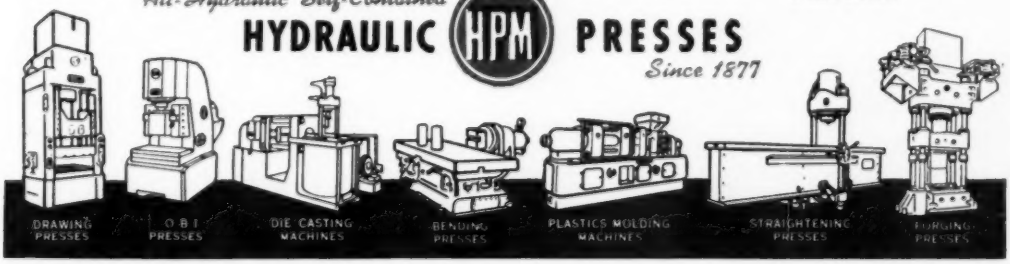
All-Hydraulic Self-Contained

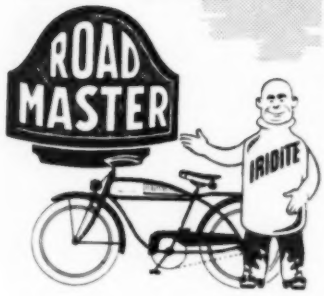
HYDRAULIC HPM PRESSES

Since 1877



IRIDITE

keeps zinc plate STAIN FREE, SPARKLING BRIGHT on



Because it *economically* gives lasting, chrome-like brightness to zinc or cadmium plate, Iridite Bright is the final finish on hardware for The Cleveland Welding Company's famous Roadmaster Bicycle.

Shop-wise, Iridite Bright offers many advantages: a simple chemical dip, ease and speed of operation, non-electrolytic, requires only usual plating shop equipment and operators. And you get uniform consistent results from manual or automatic processing operation.

A few of the many applications for Iridite Bright include wire products, such as baskets and refrigerator shelves, electrical parts, such as radio chassis and speaker frames, and many other zinc or cadmium plated parts or assemblies.

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machine-shop equipment, "all fairly up-to-date, thanks to careful planning on the part of instructors and the opportunity of having acquired surplus property. The shops are expensive to maintain and operate, but we believe they are absolutely essential . . ."

Agricultural & Mechanical College of Texas—Have more than doubled shop lab. space since the war and nearly completed modernization of machine shop, pattern shop and welding shop with surplus and assistance of some manufacturers. All overhead belt drives replaced by motor-driven units. Lab. for high-production machines is being completed. Gaging lab. has been added.

University of Toledo—Within past five years, all but three machines replaced by modern, individually motored units, mostly through government.

Tufts College—Completed a new 60 x 100-ft., one-story machine-tool lab. a year ago, stocked with "a reasonable number of machine tools through war surplus." Also have heat-treat, welding and gaging labs.

University of Utah—Have full shop equipment.

State College of Washington—Have full shop facilities.

University of Washington—Have "excellent array of machine tools" and welding facilities. Many tools from surplus, not under power because of lack of transformers.

Wayne University — Full shop equipment.

West Virginia University—Completely renovated machine and welding shops with war-surplus equipment. All belt drives gone.

University of Wisconsin—Have rehabilitated shop, heat-power labs., heating and ventilating lab., foundry, and now revamping E.E. labs. Have also added facilities to Ch.E. labs., materials testing lab., and hydraulic lab. Much equipment from surplus; but also "forced to purchase a large amount from manufacturers."

Editor's Note—Information is not uniform nor complete on all colleges because it is abstracted from letters primarily devoted to discussion of the problem presented on pages 85-91. Available data have been presented here, however, as an indication of conditions and methods.

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Manufacturers of Hack Saw Blades and Frames, Metal Cutting Band Saw Blades and the Clemson Model E-17 Lawn Machine.

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The secret of this performance and long life lies in the film type of lubrication. A properly designed and well lubricated sleeve bearing need not acknowledge any superior. No other bearing type possesses its simplicity, its ruggedness, its ability to deliver accurate work for many years. These attributes are possessed by the sleeve bearing.

Bunting engineers are at your service whether your problem is a precision grinder spindle, an aircraft engine, an automobile engine, or something of more or of less exacting requirements. Bunting engineers utilize their extensive experience with bearings of all types in their work of designing Bunting Cast Bronze Sleeve Bearings. The Bunting Brass & Bronze Company, Toledo 9, Ohio. Branches in Principal Cities.

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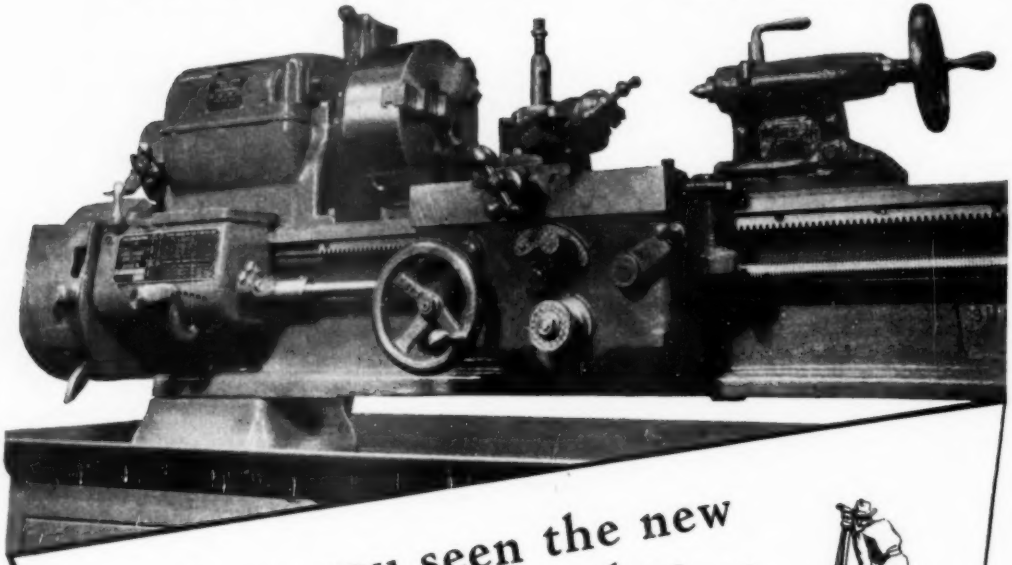
PRECISION BRONZE BARS

BUSHINGS

76

SHELDON Precision Lathes



Have you seen the new SHELDON Lathes...

From any angle a better lathe.

. . . those built in the new SHELDON machine tool plant?

Always good lathes, these new SHELDONS are even better, not only in design refinements but in extreme accuracy, greater work capacity for size, "sweeter" handling and actual beauty of finish. Only a set-up like the new SHELDON plant could build such lathes—a specially designed building, the most modern manufacturing methods, complete tooling with row on row of the finest, most modern manufacturing equipment.

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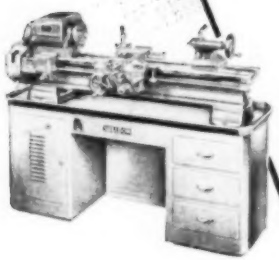

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Simplify production with economical vapor degreasing

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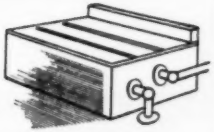
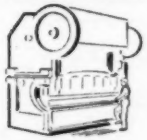


BEFORE PLATING



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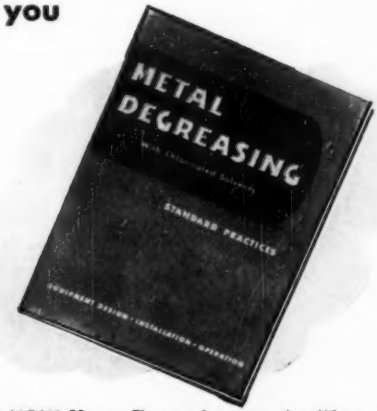

READ HOW Vapor Degreasing can simplify production . . . save you time and unnecessary costs. Read why the results obtained can't be matched by any other method. It shows typical compact equipment available for efficient and economical operation. And it gives information about solvents used in this equipment—Du Pont "Triclene" D Trichlorethylene, and Du Pont Trichlorethylene and Perchlorethylene—which under various trade marks have been widely used for many years. Send for it today!

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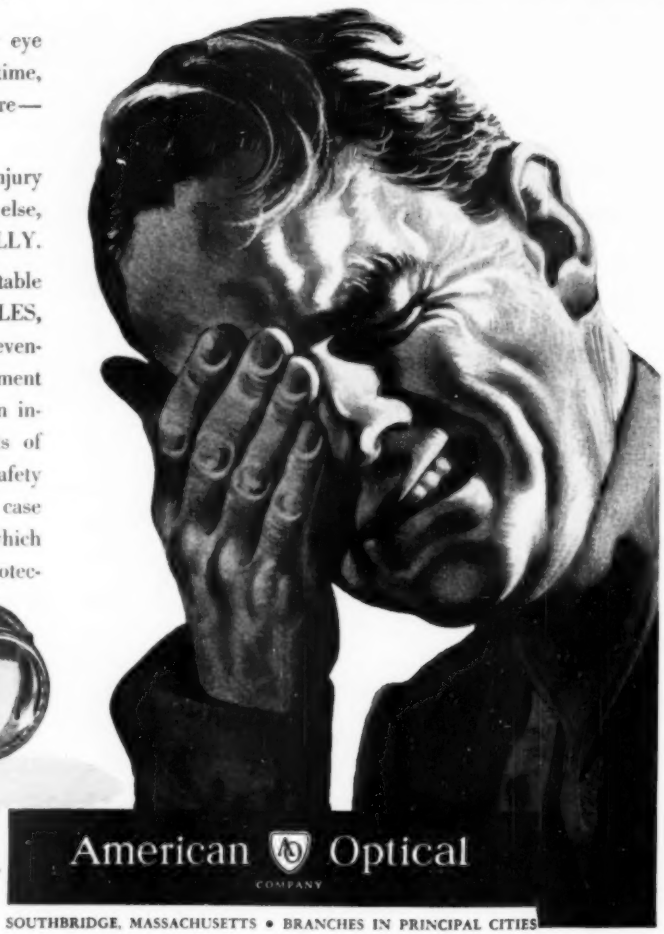
*SINCE 1939

BUT IT'S AN EXPENSE YOU CAN CUT 98% IN THESE DAYS OF STILL INFLATED COSTS!

At a $15 average, even a *minor* eye accident costs too much in lost time, idle machine time and medical care—even in periods of normal costs.

Today, like everything else, eye injury costs are UP—but *unlike* everything else, THEY CAN BE CUT, DRASTICALLY.

98% of eye accidents are preventable when workers wear SAFETY GOGGLES, according to The Society for the Prevention of Blindness... and management has found the costs of the protection infinitesimal as compared to the costs of injuries saved. Your nearest AO Safety Representative can show you many case histories in *your* industry alone which prove conclusively that adequate protection pays off. Ask him to call.



Safety Products Division of

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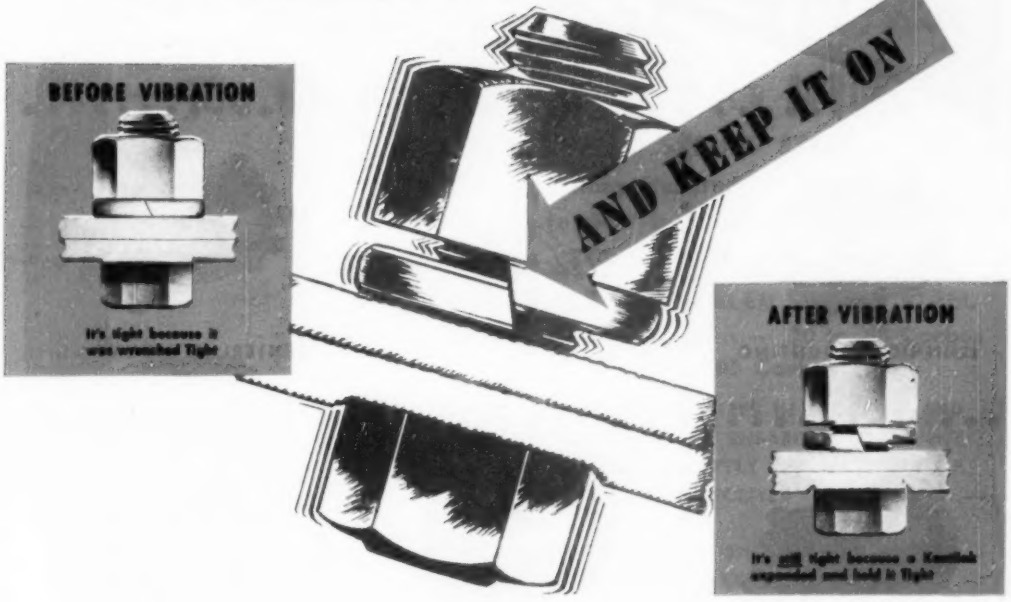
Put on the
PRESSURE...


BEFORE VIBRATION
It's tight because it was wrenched Tight
AND KEEP IT ON
AFTER VIBRATION
It's still tight because a Kantlink expanded and held it Tight

No nut can turn loose on its bolt so long as there is pressure on its threads.

Kantlink spring washers keep that pressure on. There is no substitute.

The first loosening or wear of bolted assemblies comes in the other parts, not from the nut turning on the bolt. Ductility may permit slight bolt stretch, or the gradual friction of metal on metal, or the grinding down of burrs, flares, or the pulverizing of scale, rust or paint—these things cause inevitable loosening unless a strong expanding spring washer keeps the pressure on.

The powerful expansion of Kantlink, as this inevitable wear occurs, gives you ample time to retighten before trouble starts.

For continuous pressure on all your bolted assemblies specify Kantlinks—the wide range helical spring washers that are stronger, and hold all parts tight longer.

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Newark 5, New Jersey — Milwaukee 2, Wisconsin

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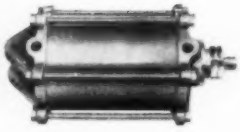

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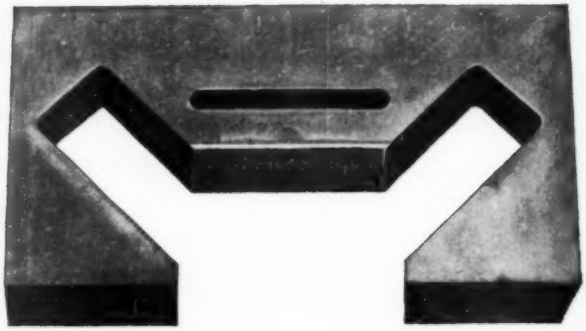
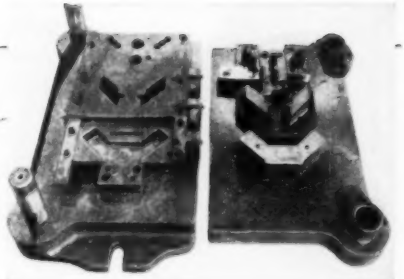
How Disston CROLOY was used to solve a die problem





ANALYSIS:

CARBON	1.50%
CHROMIUM	12.00%
VANADIUM	1.00%
MOLYBDENUM	.80%

DISSTON METALLURGISTS AND ENGINEERS will be glad to help you with your tool steel problems...and without charge or obligation.

STEEL: Everybody who wants to obtain steel can help himself to get it by immediately starting scrap into the channels that serve steel mills.

WHEN YOU BUY A DISSTON PRODUCT YOU BUY DISSTON STEEL SKILL and SERVICE

THE PROBLEM . . .

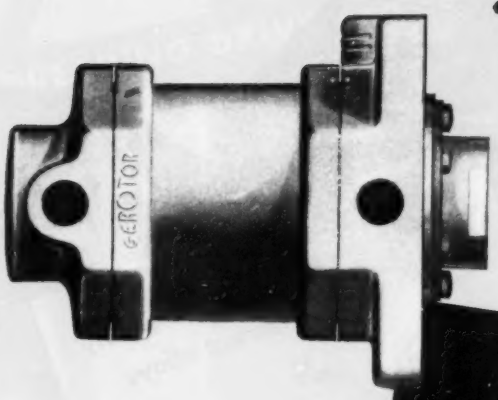
A manufacturer had been experimenting with various alloys to find the one best suited for making the wing die shown above. Specifications called for a finished die of Rockwell C 59/61, without scale and with minimum distortion . . . dimensions had to be held within .002-inch, for no tolerance was allowed for finish grinding.

THE SOLUTION . . .

DISSTON CROLOY AIR HARDENING STEEL

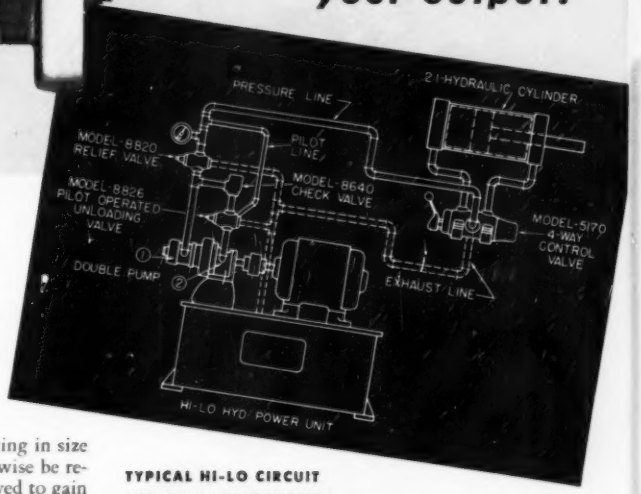
This high quality, many purpose tool steel was designed to give high resistance to sliding and impinging wear, and at the same time combine air hardening properties with reasonable machinability. It has proved to be exceptionally serviceable for tools such as punches, dies, slitting cutters, gauges, brick liner plates, wearing parts and other applications.

HENRY DISSTON & SONS, INC., 420 Tacony, Philadelphia 35, Pa., U.S.A.



Double the Rod Size—

and increase your output!



TYPICAL HI-LO CIRCUIT FOR HYDRAULIC PRESSES

GEROTOR 1500 P.S.I. HYDRAULIC 2:1 CYLINDERS have a piston rod about twice as large as standard cylinder rod size. The larger rod reduces oil displacement, permitting it to retract at twice the speed that it extends. This speed-up shortens cycle time, allowing the rod to extend again quickly, thereby accomplishing more work!

This faster speed is gained with a saving in size of motor and pump which would otherwise be required. 2:1 cylinders may also be employed to gain identical retracting and extending speeds, as well as to support larger loads where straight linear motion is used.

Available in 6 standard mountings: Foot, Trunnion, Center Line, Blind End Flange, Rod End Flange, and Clevis; in 10 bore diameters; in any stroke up to 96"; and with cushioning.

Remember—Gerotor Hydraulic Cylinders have Keeper ring design, permitting the cylinder to be rotated to convenient pipe connection.

This circuit illustrates a press application where rapid speed and low pressures are required for the major portion of the stroke and high pressures are required for the "squeeze" portion of the stroke. The output of both the low pressure high volume pump (2) and the high pressure small volume pump (1) is directed to the hydraulic cylinder at a low operating pressure. When sufficient work load builds up, pressure in the system increases and the model 8826 pilot operated unloading valve unloads the output of pump (2) while the output of pump (1) is still directed to the cylinder. Direction of piston travel is controlled by model 5170 4-Way control valve. The horsepower requirement for this type of circuit is much less than if a single pump of sufficient volume and pressure for the application were used.

Send for Catalog Section No. 103 illustrating and describing all types and sizes of Gerotor Hydraulic Cylinders.

GEROTOR MAY CORPORATION
DEPT. AM-4 • BALTIMORE 3, MARYLAND

WHEN YOU APPLY HYDRAULIC OR AIR POWER *Plan with* **GEROTOR**

AIR AND HYDRAULIC VALVES AND CYLINDERS, HYDRAULIC PUMPS, MOTORS AND PUMP UNITS

. . . to suit your every need!

Do you make rivets . . . other cold-headed products? Do you need quality copper-alloy wire to be headed, extruded, drilled, or redrawn? Do you need wire of a certain degree of hardness, malleability?

Have you read the headline of this ad? Then you know the answer!

Come to Chase. Chase service, Chase quality . . . is just what you've been looking for. The word quality here means many things . . . freedom from physical defects . . . uniformity of surface texture and color . . . accuracy of dimensions . . . precise adjustment of temper and control of grain size.

Come to the nation's headquarters for brass and copper. Call your nearest Chase Warehouse or Service Office today!

Chase

the Nation's Headquarters for
BRASS & COPPER

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SUBSIDIARY OF KENNECOTT COPPER CORPORATION

THIS IS THE CHASE NETWORK . . . handiest way to buy brass

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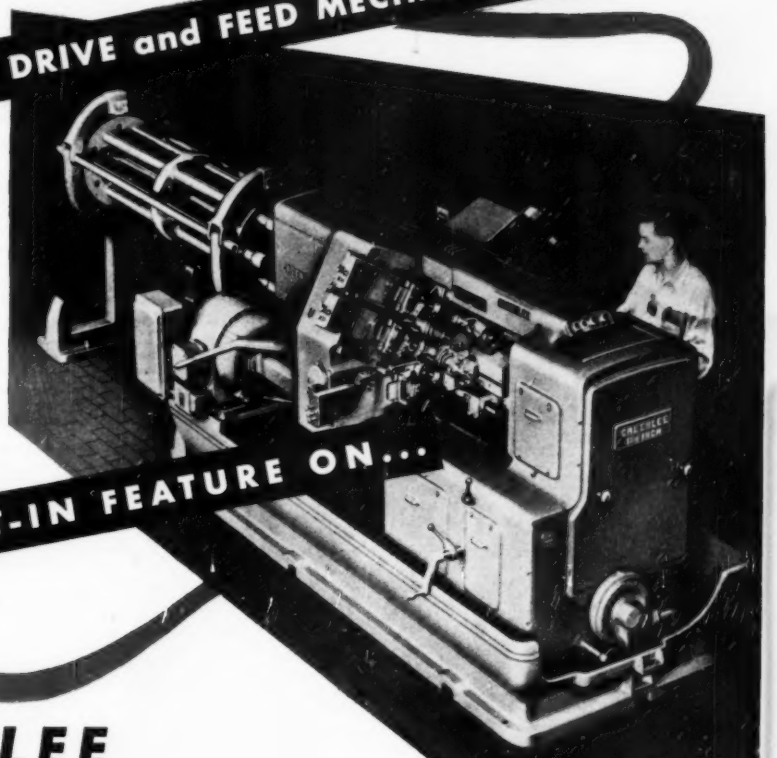
THREADING DRIVE and FEED MECHANISM...

IS A BUILT-IN FEATURE ON...



GREENLEE AUTOMATICS

● A threading drive and feed mechanism is *standard* equipment on Greenlee Automatics. It is *built into* the machine to handle threading attachments in the 3rd, 4th, 5th, and 6th positions. A duplex clutch and shifting lever takes care of *either* right-hand or left-hand threading and tapping tools.

For ease and speed in set-ups and job-changes, Greenlee's *universal tooling* is the answer. *Interchangeable* tool holders fit any cross slide cavity . . . can be changed quickly . . . and insure precision and uniformity in the production of duplicate parts. These outstanding GREENLEE features can greatly improve the efficiency of your production.

PRODUCTION MACHINERY

GREENLEE

WRITE FOR LITERATURE — There are many more money-saving, cost-cutting features of Greenlee Automatics. Let us send you additional literature.

GREENLEE BROS. & CO., 1724 Mason Ave., Rockford, Illinois

MULTIPLE-SPINDLE DRILLING, BORING, TAPPING MACHINES • AUTOMATIC SCREW MACHINES • AUTOMATIC TRANSFER PROCESSING MACHINES

$1,500 inventory abolished —at a cost of $4.46!

With more than 700 vacuum tubes needed by industry, a tube distributor would find profits consumed by 100% inventories. But by ordering tubes as needed via Air Express, he holds stocks to 25%. Example: Orders $1,500 tube at 9 A.M. from supplier 900 miles away. Delivered to customer 6 P.M. same day. 16 lbs.: cost, $4.46.

Remember, $4.46 *included* speedy pick-up and delivery service, too. *More* protection, because you get a receipt for every shipment. Air Express is *world's fastest* shipping service.

Your Air Express shipments go by the Scheduled Airlines direct to 1300 airport cities; fastest air-rail for 22,000 off-airline offices. Shipments *keep moving* with 'round-the-clock service.

Facts on low Air Express rates

19 lbs. of machine parts goes 600 miles for $3.54.
9-lb. carton of new styles goes 1400 miles for $3.99.
(Every kind of business finds Air Express pays.)

Only Air Express gives you all these advantages: Special pick-up and delivery at no *extra cost. You get a receipt for every shipment* and delivery is proved by signature of consignee. One-carrier responsibility. Assured protection, too—valuation coverage up to $50 without extra charge. Practically no limitation on size or weight. For fast shipping action, phone Air Express Division, Railway Express Agency. And specify "Air Express delivery" on orders.

SPECIFY AIR EXPRESS
— GETS THERE FIRST —

Rates include pick-up and delivery door to door in all principal towns and cities

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SCHEDULED AIRLINES OF THE U.S.

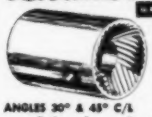
Severance DEBURRING CUTTERS
HIGH SPEED CARBIDE

Unexcelled for power and hand deburring
Sectional pattern teeth give shearing action

Severance INSIDE DEBURRING CUTTERS

Select 45° High Speed cutters from 28 standard sizes and 30° cutters from 35 sizes—from ¼" to 3" diameters.
Both angles can be supplied in CARBIDE

Severance OUTSIDE DEBURRING CUTTERS



For speedy light deburring of rod ends and tubing O. D's., either offhand or in screw machines. Select 30° cutters from 14 standard sizes and 45° cutters from 10 sizes—up to 4 inch diameter.
ANGLES 30° & 45° C/L
Both angles can be supplied in CARBIDE

OUTSIDE CHAMFERING MILLS

Operate in machines to perform heavy chamfering without chatter —in above size range and angles.

HEADQUARTERS FOR DEBURRING AND CHAMFERING TOOLS DEVOID OF CHATTER

Severance HAND DEBURRING CUTTERS

"A Twist of the wrist" easily bites off the bur left by drill or punch.
Ten standard sizes for 1/8 to 2" diameters.
Write for Bulletin 16-D

Complete REGRINDING Service — by New Tool Craftsmen — Savings are thus multiplied —

SEVERANCE TOOL INDUSTRIES, INC.
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MAKES QUALITY SCREW MACHINE PRODUCTS

It's no question . . . it's a fact!

When you need cap screws, set screws, milled studs or coupling bolts of any machineable material and with *any* thread, remember . . . WHO makes them better.

WHO is... WM. H. Ottemiller Co., YORK, PA.
Write for name of nearest distributor and our free illustrated folder.

The RANDALL & STICKNEY Platform Gauge

. . . . takes work up to 7 inches

Work of similar size can be quickly and easily inspected by setting gauge head at desired height with standard block or plug. Spindle on gauge head travels ½".

Dial graduated 0 to 50 in thousandths; second-hand records 10ths of inches. Can be furnished to read to .01 mm.

Base 8" square; height 13"; weight 18½ lbs.

Investigate Now!

FRANK E. RANDALL CO.
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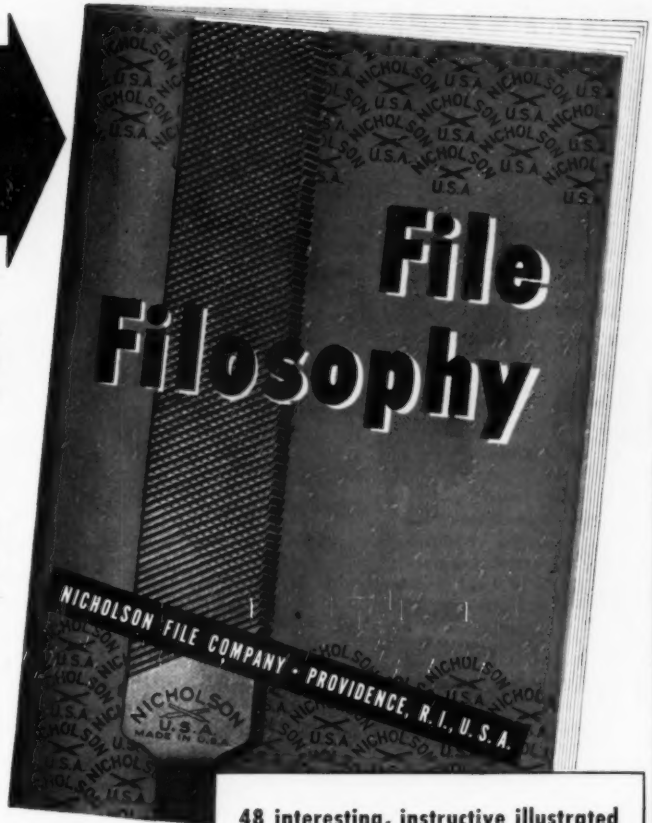
Waltham 54, Mass.

NEW EDITION



FREE to industrial managements for use of executive, production and purchasing heads, shop foremen, key mechanics.

USE COUPON *(or letter)* to request number of copies needed for judicious distribution throughout your organization.

"FILE FILOSOPHY," a practical guide in the art of filing, has become universally accepted as an authority in its field: and sixteen editions with repeated printings have totaled nearly half a million copies — making it the most widely distributed book of its kind. Mechanical and technical experts have used it as a foundation for articles in the machinist and industrial press and for talks in the workshop and classroom. It is a recognized "textbook" in hundreds of mechanical training schools.

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Send.....copies of the new 1949 edition of "File Filosophy."

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ROTO-MATICS

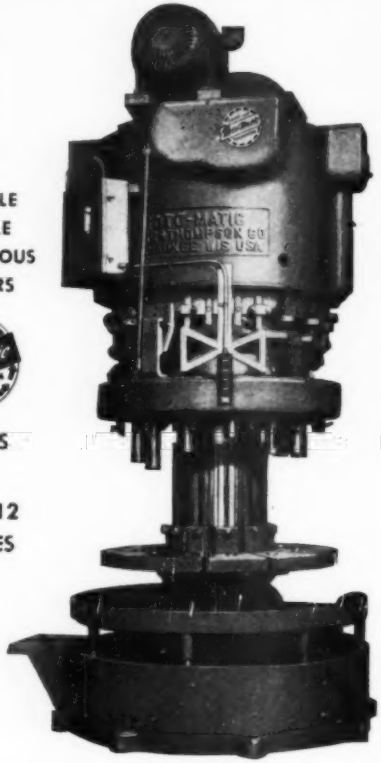
VERTICAL

MULTIPLE SPINDLE CONTINUOUS DRILLERS

DAVIS and THOMPSON Roto-Matic

3 SIZES

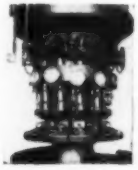
6-8 OR 12 SPINDLES



One Vertical ROTO-MATIC will equal the production of a whole battery of single spindle drillers with a proportionate reduction in labor and maintenance costs.

Where production demands fall below the capacity of the machine, on a single part, interchangeable fixtures can be designed for a variety of jobs. Where two operations are required on a single piece, requiring the same feeds and speeds, spindles can be arranged to give you the proper ratio of production.

2 SPINDLE DRILL HEADS



BALANCING OPERATION

AUTOMATIC CLAMPING

Engineering skill and thirty years of development have given us the necessary background to tool up these machines for the maximum in efficiency and accuracy of work, whether it be drilling, milling, boring, reaming, spot facing or chamfering.

WRITE FOR BULLETIN 101.

DAVIS and THOMPSON CO.

MANUFACTURERS OF *Machine Tools*

MILWAUKEE 14, WISCONSIN

HOW TO SELECT *the Right* UNIVERSAL JOINT

Universal joints perform various functions in a wide variety of applications — from heavy duty power transmission to high or low speed light duty installations. Selection of the *right* joint for the job is important.

Either the Curtis Standard — available in 14 sizes, from ⅜" O.D. to 4" O.D., single or double — or the *new* Curtis Ball-Type in 4 sizes, from ½" O.D. to 1-¼" O.D., will enable you to specify the correct size and strength of joint to secure the most economical and trouble-free installation.

For heavy-duty jobs specify Curtis Standard Joints — made of alloy steel throughout with each part heat treated and ground for maximum strength, long life and accuracy.

For light-duty work specify Curtis Ball-Type Joints — with bronze center ball and steel forks with center pins of heat treated, centerless ground steel.

Select the RIGHT joint for your particular purpose from the data shown below —

Cat. No.	Type	O. D.	Overall Length	Breaking Loads: Static Torque In. lbs.	Breaking Loads: Tensile Load Pounds
C-642	Std.	½"	2"	340	1000
CS-42	Ball	½"	2"	170	720
C-644	Std.	¾"	2-11/16"	1300	2800
CS-44	Ball	¾"	2-11/16"	650	2000
C-646	Std.	1"	3-3/16"	2500	5150
CS-46	Ball	1"	3-3/16"	1250	3600
C-648	Std.	1¼"	3-¾"	5000	7200
CS-48	Ball	1¼"	3-¾"	2500	4950

All Curtis Joints can be furnished with hubs machined to your specifications. Drawings should accompany inquiry if possible.

For complete engineering data and drafting templates write Dept. B-3

CURTIS UNIVERSAL JOINT CO. INC.

SPRINGFIELD MASS.

Pittsburgh CARGOTAINERS

helped save 2[illegible] man hours per month

at INGERSOLL STEEL

OLD WAY:
Handling small parts in all sorts of containers posed real warehousing problem — wasted storage space.

NEW WAY:
In collapsible Cargotainers, small parts now move easily from receiving through shipping. 50% reduction in handling costs—85% increase in storage capacity.

You may feel that small materials handling is an unimportant part of business—yet here's how Ingersoll Steel Company saved 2067.70 man hours a month* after installing pallets and Pittsburgh collapsible Cargotainers:

Formerly, small parts were received from vendors in odd size barrels, kegs, cartons, boxes, burlap bags and loose. This resulted in excessive labor costs in receiving, warehousing and stock assembly lines and additional handling of parts which caused high scrap and damage loss. Lack of standardization of containers prevented proper inventory control and warehousing.

Nine months ago Ingersoll Steel standardized on pallets and Pittsburgh collapsible Cargotainers. These wire-mesh baskets were supplied to their vendors and the receiving, storing and shipping departments. Parts were uniformly stacked and better protected—excessive handling was eliminated—there was complete inventory control—a reduction in scrap loss—full utilization of storage space. This all added up to better housekeeping—safer and more efficient handling operations for both Ingersoll Steel and its vendors.

It will pay you to investigate Pittsburgh Pallets and Cargotainers. For your copy of our catalog write to Department AM, Pittsburgh Steel Products Company, Grant Building, Pittsburgh 30, Pennsylvania.

** From "Wire Containers For Small Parts", Modern Materials Handling, December, 1948.*

CARGOTAINERS

by

Pittsburgh Steel Products Company

A Subsidiary of Pittsburgh Steel Company

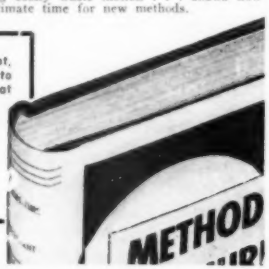
How to develop
MORE EFFICIENT OPERATING PROCEDURES
for office and plant

Here's an entirely new approach to the problem of measuring time in manufacturing operations. This method enables you—*without use of the stop-watch*—to make accurate time estimates for a complete set of movements comprising any proposed job . . . helps you evaluate different methods, and alter product design while still in the blueprint stage.

This new manual is your answer to efficient time-saving methods for every regular function in your office and plant. It gives you proven procedures for breaking down each type of work into its step-by-step movements . . . describes techniques for eliminating costly waste motion . . . shows how to establish time standards and estimate time for new methods.

Any manufacturer, superintendent, or foreman can put this guide to work in developing standards that

- improve existing methods
- help determine effective production operations
- serve as a guide in designing products for economical output



METHODS-TIME MEASUREMENT

By

HAROLD B. MAYNARD, President, Methods Engineering Council

G. J. STEGEMERTEN, General Manager, Methods Engineering Council

JOHN L. SCHWAB, Division Manager, Methods Engineering Council

290 pages, scores of illustrations, charts and graphs, $3.75

You get techniques for application of time-measurement to every motion, without previous use of the stop-watch . . . concrete answers to problems of efficient, low-cost production. You're shown what the basic movements are, how to observe them, and how to take positive steps toward money-saving production methods.

Check over the twenty-nine chapters:

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3. Development of Data
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5. Reach
6. Move
7. Turn
8. Grasp
9. Position
10. Release Load
11. Disengage
12. Walking
13. Other Motions
14. Principles of Limiting Motions
15. Accuracy of Standards
16. Elements of Measurement
17. Information and Observation
18. Computation
19. Estimating from Drawings
20. Principles of Motion Economy
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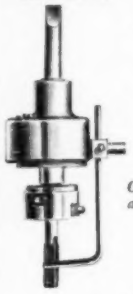
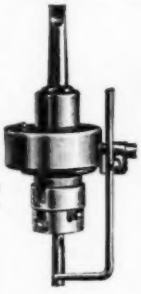
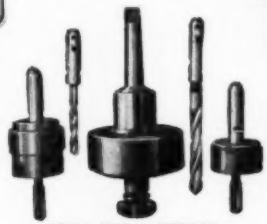
Size	Tap Exact Size
No. 00 H.S.	Up to ¼"
" 00	⅛"
" 0	3/16"
" 1	5/16"
" 2	⅜" 1 "
" 3	⅝" 1¼"
" 4	¼" 1½"
" 5	⅞" 2 "



Our High Speed Tappers are Super-Sensitive for Small Tapping



Style B Positive Stop Holds Work Down

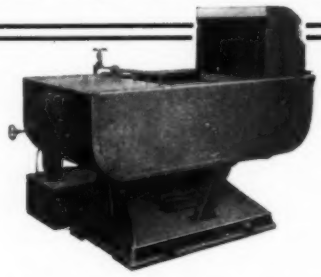


Style C Graduated Adjustable Safety Friction

DRILL PRESS TURRET

Style D-E with Quick-Change Tool Holders to Drill, Tap and Set studs, etc., without moving work, or stopping or reversing machine. Individual friction adjustment in each tapholder. If required. Also, Opening Die-Heads; Opening Stud-Setters; Friction Screw-Drivers and Nut-Setters, etc.

"PEERLESS" No. 3 W-20
Wet or dry BELT SURFACER



. . . for high production and greater accuracy

Production's leadership in the field of surfacing, finishing and polishing is again evidenced . . . in this recent development. The No. 3W-20" machine (available also in a 14" size) is specially designed for handling the surfacing of a wide range of large parts in a variety of materials. It is powerful and fast, and provided with an adequate coolant system for heat-resisting operation. It can also be used for dry surfacing.

Ask for complete details.

SPECIFICATIONS

Working Surface: 20"x30".
Belt Width: 20"
Belt Speed: 4600 ft. per min.
Drive Motor: 10 HP.

Production
MACHINE COMPANY GREENFIELD, MASSACHUSETTS, U.S.A.

COLD FINISHED BAR
Automatic Screw Stock

YOUNGSTOWN Cold Finished Carbon and Alloy Steel Bars are now being produced in a wide range of sizes and shapes, supplied either in coils or straight lengths.

Drawn to meet standard specifications, these bars have the characteristics that make them ideal for high-speed screw machine operations--uniformity of composition, toughness and strength, close tolerances in dimension, and smoothness and brightness of finish.

You'll find a Youngstown bar stock to meet almost any requirements. Tell our representative what you want and we will make every effort to serve you at once.

QUALITY V YOUNGSTOWN SERVICE

Youngstown
COLD FINISHED CARBON AND ALLOY STEEL BARS

THE YOUNGSTOWN SHEET AND TUBE COMPANY
General Offices — Youngstown 1, Ohio

Manufacturers of Carbon, Alloy and Yoloy Steel
Export Office-500 Fifth Avenue, New York

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THE CHIPS ARE OUT... COLD

here's why

Lusol

COOLANT

(2) CASE HISTORY

MACHINE	OPERATION	MATERIAL
Snyder Horizontal Multiple Spindle Drilling & Tapping Machine	Drill 11/16" hole 7/8" deep. Tap 3/4"-No. 20	Steel Casting

PRODUCTION

OTHER COOLANTS	LUSOL
1984 pieces in 50 hrs. using 41 drills, 25 taps	2060 pieces in 50 hrs. using 12 drills, 8 taps

Saved with Lusol 29 DRILLS 17 TAPS

F. E. ANDERSON OIL COMPANY
PORTLAND, CONNECTICUT
RUST PREVENTIVES • SPECIAL INDUSTRIAL FLUIDS • CLEANERS

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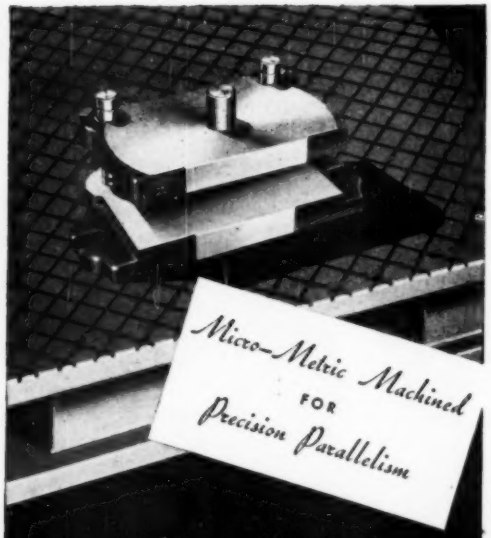

"DETROIT" standard die sets are Micro-metric jig-bored and machined to exceptionally close limits of parallelism, flatness and squareness with the guide-pin axis. This precision reduces strain warping, and results in longer die life and long, uninterrupted production runs. Order from your "DETROIT" representative.

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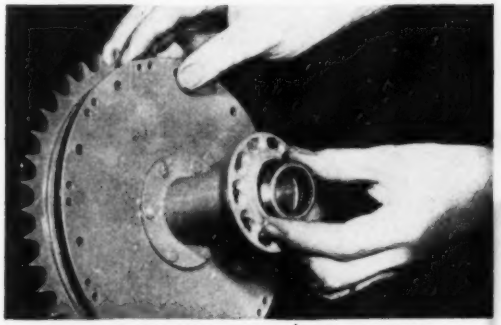
DETROIT DIE SET CORPORATION
2895 W. GRAND BLVD. • DETROIT 2, MICHIGAN

DETROIT DIE SETS ★

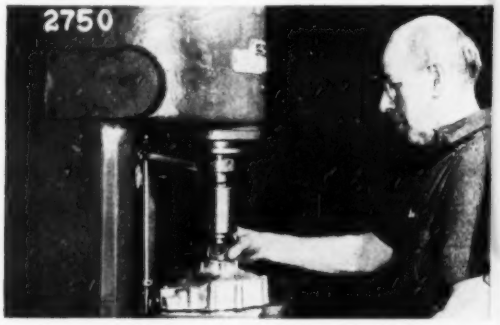
Torrington Needle Bearings Specified For Lighter Design and Longer Life In Indian Motorcycles

The new Arrow and Scout Motorcycles are designed throughout for lightness, power, safety and economy by Indian Motocycle Company. To withstand severe shock loads, reduce friction and secure compact design, Indian specifies Torrington Needle Bearings—22 in the Arrow and 24 in the Scout.



Needle Bearings take the jar of rough riding at high rotating speeds in the rear wheel hub (above) and the front wheel hub. With their full complement of small diameter rollers, Needle Bearings take less space and provide higher radial capacity than any other comparable anti-friction bearing.

More horsepower per pound is delivered by the new Indians. Power loss is reduced with 8 Needle Bearings in the transmission. Two Needle Bearings on the main shaft give unusual stability, assuring efficient sealing with the standard oil closures pressed in behind them.

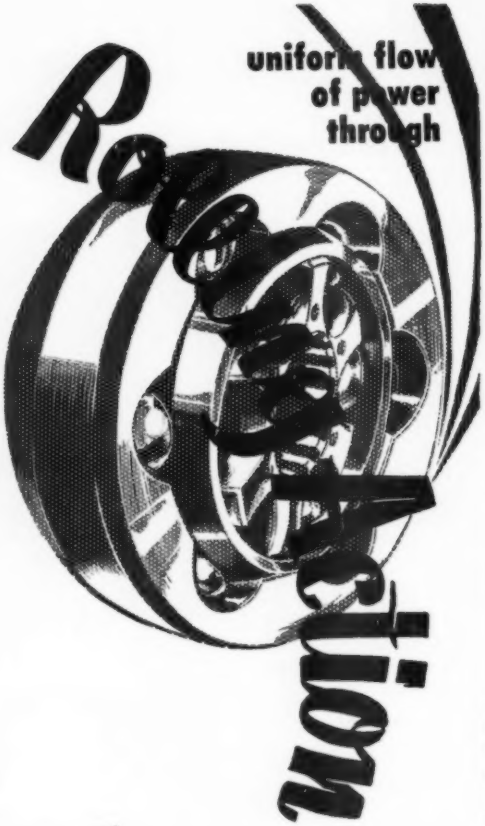


Manufacturing economy is assured by the easy installation of Needle Bearings in simple, easily-fabricated housings. Needle Bearings mean operating economies, too—minimum attention for maintenance and lubrication. Past experience indicates these efficient bearings will serve the life of the motorcycles.

Lightweight design, high capacity, long service life and economical production can be yours with Torrington Needle Bearings. Our engineers will be glad to help you adapt these compact anti-friction units to the requirements of your equipment. Write us today. THE TORRINGTON COMPANY, Torrington, Conn., or South Bend 21, Ind. District offices and Distributors in principal cities.

TORRINGTON *NEEDLE* **BEARINGS**

Needle • Spherical Roller • Tapered Roller Straight Roller • Ball • Needle Rollers



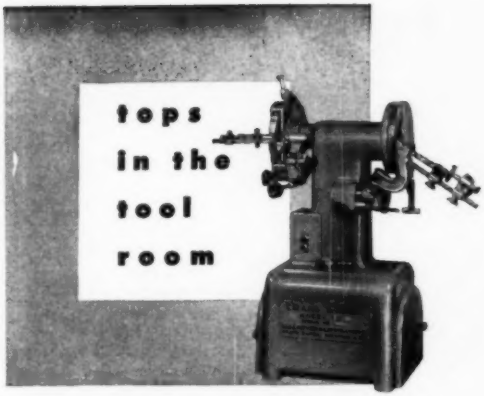
RZEPPA DISC and BELL TYPES

GEARGRIND PROPELLER SHAFT TYPES

CONSTANT VELOCITY UNIVERSAL JOINTS

Smooth, uniform, vibrationless transmission of power from one rotating shaft to another—through varying degrees of angularity—is now available to industry. Rzeppa and Geargrind Constant Velocity Universal Joints are manufactured in a wide range of types and sizes. For specific recommendations, send us your prints and pertinent information.

The GEAR GRINDING MACHINE COMPANY
DETROIT 11, MICH., U.S.A.



Save three ways with Grand Rapids No. BD-1 Combination Tap and Drill Grinder: 1. Lower first cost; 2. Less maintenance expense; 3. Valuable floor space.

Grand Rapids BD-1 combination Tap and Drill Grinder

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Manufacturers of Grand Rapids Grinders
330 STRAIGHT ST., S.W., GRAND RAPIDS 4, MICH.

DRILL BREAKAGE
Reduced 86.7%

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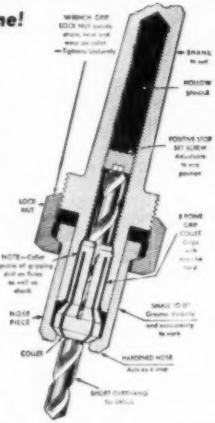
Large automobile manufacturer, famous for production efficiency, gave us the following report of a test of the Erickson Collet Chuck. As a result of this test, manufacturer has standardized on Erickson Collet Chuck for this operation.

"Erickson chuck is used for drilling 1200 vent holes per day, average drill breakage one per day. We formerly broke from 8 to 10 drills with the ——— chuck. Now have average breakage of 2 drills per 900 oil holes drilled in pistons with 7/8" Erickson chuck. Had breakage of 15 drills per 900 holes using old drill sleeve method."



NO OTHER COLLET CHUCK ON THE MARKET

1. Delivers accuracy of .0005" TIR.
2. Permits collapse of 1/32" (Replacing 7 standard single purpose collets.)
3. Grips drills on flutes—permits stubbing.
4. Gives such positive grip due to exclusive surface contact.

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Send for complete data on Erickson holding equipment now and learn how Erickson tools applied to your problems can boost production and reduce costs.

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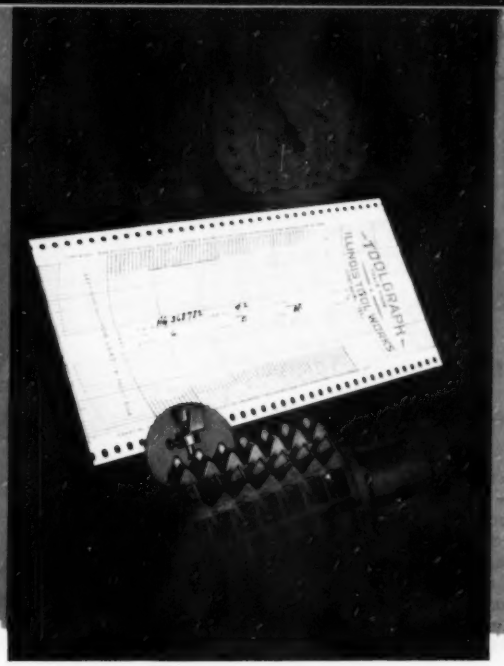
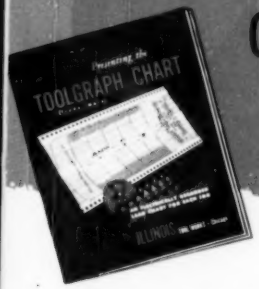
developed by
ILLINOIS TOOL,
the TOOLGRAPH* CHART

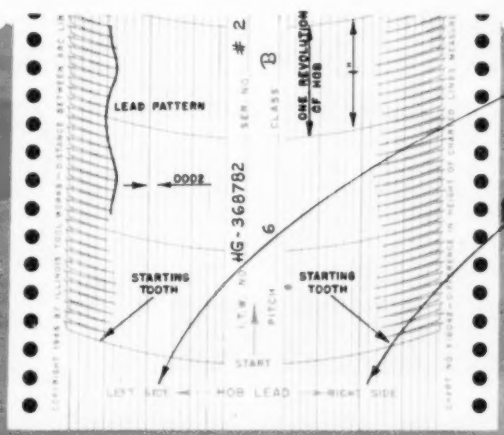


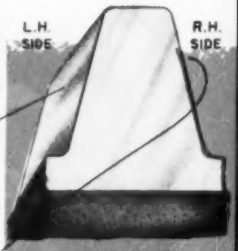


PROVIDES *Visual Proof* OF HOB ACCURACY!

For more than 36 years, Illinois Tool Works has been universally recognized as a leading producer of hobs of extreme accuracy and high quality. And now, as an extra service to users, Illinois Tool offers visual proof of hob accuracy which aids inspection and eliminates duplicate checking. Packed with every hob is a Toolgraph Chart . . . an *electrically* recorded chart of the hob lead which reveals the pattern, as well as the magnitude, of any deviation from nominal dimensions. This chart is far more accurate and is easier to evaluate than the commonly furnished indicator readings.

The Toolgraph Chart is described in detail in Booklet A-29. Write for a free copy, today, so that you may completely appreciate the significance of this extra service relative to your gear problems . . . another reason for making Illinois Tool Works . . . your "Headquarters for Metal Cutting Tools."





Illustrated at left is a section of a Toolgraph Chart which shows deviation within tolerance, the exact location of each tooth in relation to all other teeth and in relation to the desired theoretical lead helix.

ILLINOIS
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2501 North Keeler Avenue • Chicago 39, Illinois
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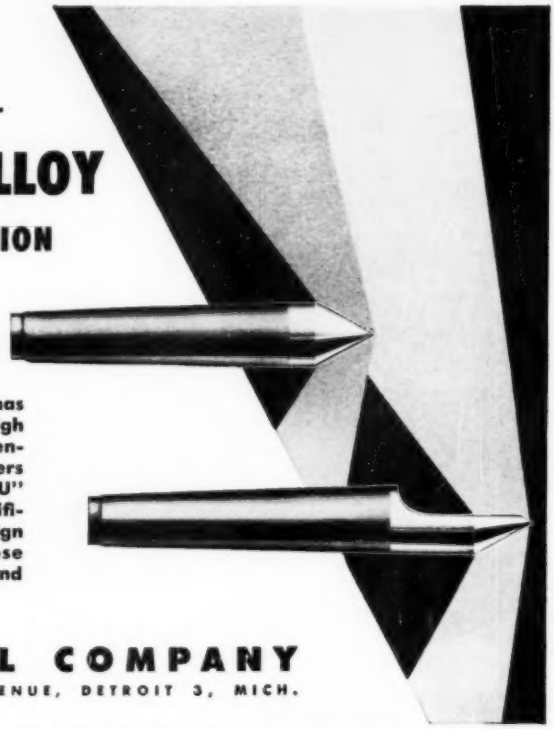
For really *tough* going—

GORHAM M-40-U ALLOY

RESISTS WEAR AND ABRASION

3 to 10 times longer!



So superior is this alloy that *by actual test* it has shown results 3 to 10 times better than high speed steel and other alloy materials for centers. Standard "M-40-U" alloy tipped centers can be furnished from stock. Special "M-40-U" alloy centers can be furnished to your specifications, or our engineers will help you design special centers to fit your needs. Choose GORHAM "M-40-U" for top performance and long wear.

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14400 WOODROW WILSON AVENUE, DETROIT 3, MICH.

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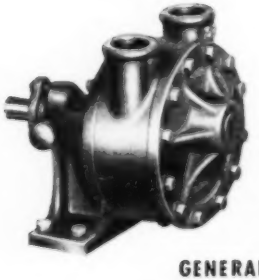
carefree performance...



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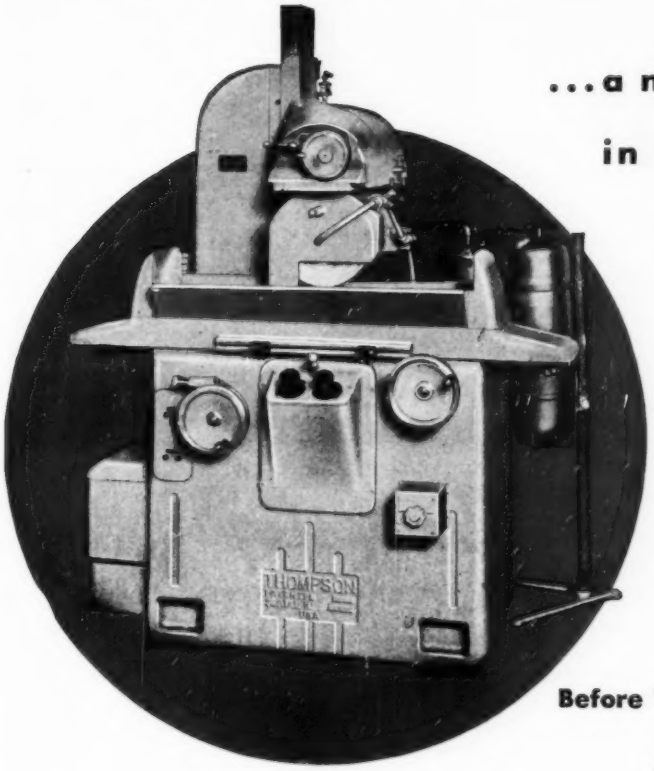
GREATLY IMPROVES GRINDING METHODS



...a new development in surface grinding by THOMPSON

Now you can grind very thin sections without burning and warpage.

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Very fine finishes are obtained to extremely close dimensions. An outstanding advantage of this patented process is gained in grinding blanking dies and other metal cutting or shearing tools. No amorphus metal is present after grinding. This increases the life of the tool between grinds.

WRITE TODAY **for details of this new process and for information on ways it can save you production time and money! Address Dept. 10, The Thompson Grinder Company, Springfield, Ohio.**

Thompson SURFACE Grinders

Kodak

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THROWING GOOD GEARS AWAY

Kodak Conju-Gage, Model 1S, for testing gears up to 1¼-inch pitch diameter. Other models test gears up to 8¼-inch pitch diameter.

Even the most accurate master gears vary by some permissible tolerances. So when you test production gears against them, two separately allowable tolerances can add up to rejecting a good gear. Or two opposite tolerances can cancel out and make a gear look good when it isn't.

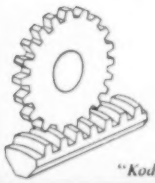
Here is a new, highly accurate check—the Kodak Conju-Gage.

In this, the production gear revolves against a Kodak Conju-Gage Worm Section (produced by a precision thread-grinding operation). A single one of these is accurately conjugate to a gear of any helix angle and diameter as long as it has the same normal pitch and pressure angle.

This gaging element can be made far more accurate than circular master gears—in much finer pitches and with any tooth form. It can be used to check for taper, position, and amount of crown, as well as for runout, pitch error, profile error, tooth thickness variations, and lateral runout.

If you want to cut unnecessary rejection losses on gears and yet reduce inspection costs, write for information on Kodak Conju-Gages to

EASTMAN KODAK COMPANY
Industrial Optical Sales Division
Rochester 4, N. Y.



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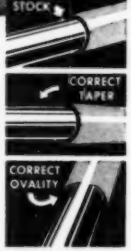
"Kodak" is a trade-mark

It's Come to America Now!

Delapena
PAT. APPLIED FOR
EXTERNAL HONING EQUIPMENT



No more need for costly lapping. Instead, use this inexpensive method of honing to exact size. Abrasive element removes stock, corrects ovality or taper, produces micro-inch quality finish. Accurate size on any material from turned or ground surface. Very simple, fool-proof, trouble-free design; no specialized skill or lengthy training required (just move the hone back and forth over the revolving surface). Four sets cover range from 1/16" to 1" diameter.

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Exclusive Sales Representatives in U. S. A.
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THE POSSIBILITIES OF THE NATIONAL KEYSEATING MILLER *on Your Work*

Several widths of cutters can be used with each size miller and many different hole diameters keyseated with one tool through the use of eccentric bushings.

• Shops all over the country are solving difficult keyseating problems by chucking this attachment on their drill presses, radials and horizontal boring mills—and milling keyseats in pieces too large or bulky for convenient handling on keyseating machines.

The "National" goes through the hole once and mills keyseats with parallel sides and parallel with the axis of the bore. It's a big time and money saver and is available in standard stock diameters from ½" to 3½" for cutting lengths from 1⅞" to 12". It will keyseat in blind holes, and offset holes. We also manufacture oil-grooving millers.

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11 RESISTANCE TO FATIGUE
12 EASY TO PLATE OR FINISH
13 RESISTANCE TO ABRASION AND WEAR

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6000 INDIVIDUAL ITEMS IN STOCK

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7 spindle tool rotating automatic chucking machine

Four Machine Spindles for boring, turning, facing and reaming operations on one to three ends provide greater and quicker production than any other "chucker" in the machine tool industry.

Three Threading Spindles perform from one to three right or left hand single or double threading operations, on one, two or three ends simultaneously, in perfect alignment, at productions from 100 to 500 pieces per hour.

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Famous for

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- LOW CHASER COST
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Bulletins available: General Purpose Die Heads, Insert Chaser Die Head, Threading Machines.

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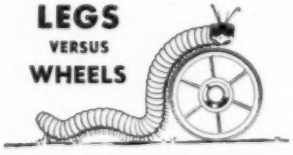

- God developed legs for locomotion of many of nature's creatures.
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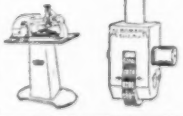
- Acromark uses both principles in the manufacture of marking and numbering machines for your products.



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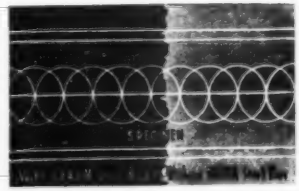
STOPS LOSSES
making dies & templates



Simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

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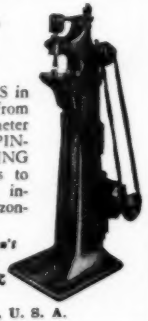

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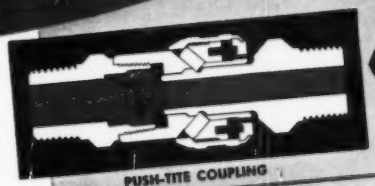
Shut ✔TIME ✔TROUBLE ✔MONEY WITH THESE HANSEN COUPLINGS

HANSEN PUSH-TITE COUPLING

Shuts off one side of line

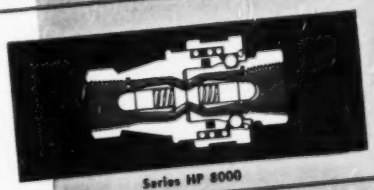
Gives quick connection and disconnection, with instant automatic flow or shut-off. To connect coupling, and open line to flow of fluid, merely push plug into socket. To disconnect, a slight pull on sleeve releases plug and shuts off supply end of line.



PUSH-TITE COUPLING

HANSEN HIGH PRESSURE TWO-WAY SHUT-OFF COUPLING

To connect, pull back sleeve and push plug into socket. Identical torpedo type valves permit free flow of gas or liquid through coupling. To disconnect, pull back sleeve . . . coupling immediately disconnects, valves automatically seal both ends of line. Can be mounted to disconnect automatically where fluid lines may be subject to sudden, damaging strain.



Series HP 8000

HANSEN STRAIGHT-THROUGH COUPLING

Provides quick connection and disconnection, but does not have shut-off feature. Size range for general use from ¼" to 2½". Two special types of straight-through steam couplings also available—one for low pressures, and one for high pressures.

Series ST Straight Through Coupling

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QUICK CONNECTIVE FLUID LINE COUPLINGS...

THE HANSEN MANUFACTURING COMPANY

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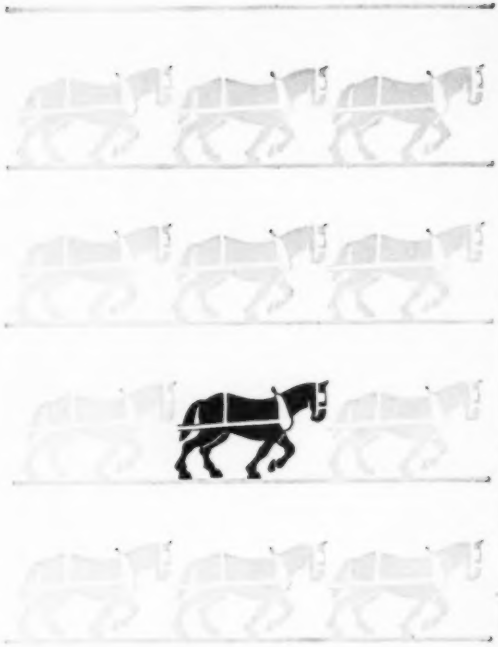

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Are you looking for a metal cleaner that will do more than just get your production clean? Investigate Parco Cleaners.

Parker's research department, with the knowledge and experience of a third of a century in the science of fine metal finishing, has formulated a line of cleaners whose benefits and advantages carry beyond the rinse-off.

Parco Cleaners remove the grease and soil—and act to condition the metal for the next step in the finishing operation. Now you can select a cleaner that helps you get economy and uniform, high-quality results with your finish.

Try a *harder-working* cleaner on your metal finishing line. Let us help you determine the Parco Cleaner that's right for you.

Get full information!

Write for technical bulletin detailing properties of each Parco Cleaner.

Bonderite, Parco, Parco Lubrite—Reg. U. S. Pat. Off.

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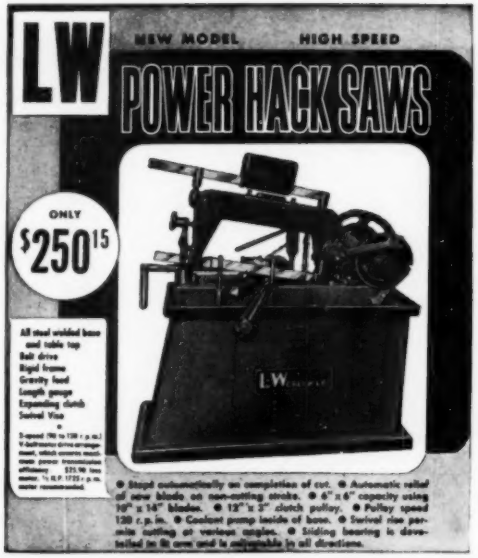

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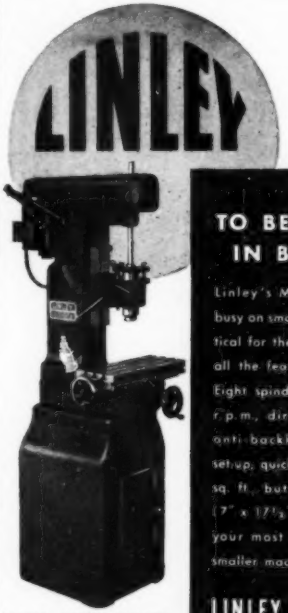

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Linley's Miller & Jig Borer keeps busy on smaller jobs that aren't practical for the big timers... and, it has all the features you're looking for. Eight spindle speeds.. 275 to 4250 r.p.m., direct micrometer setting, anti-backlash in quill travel, easy set-up, quick changeover. Fits in 2½ sq. ft., but has ample table area (7" x 17½"). You'll find it's one of your most useful and profitable smaller machines.

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Machines that pay for themselves.

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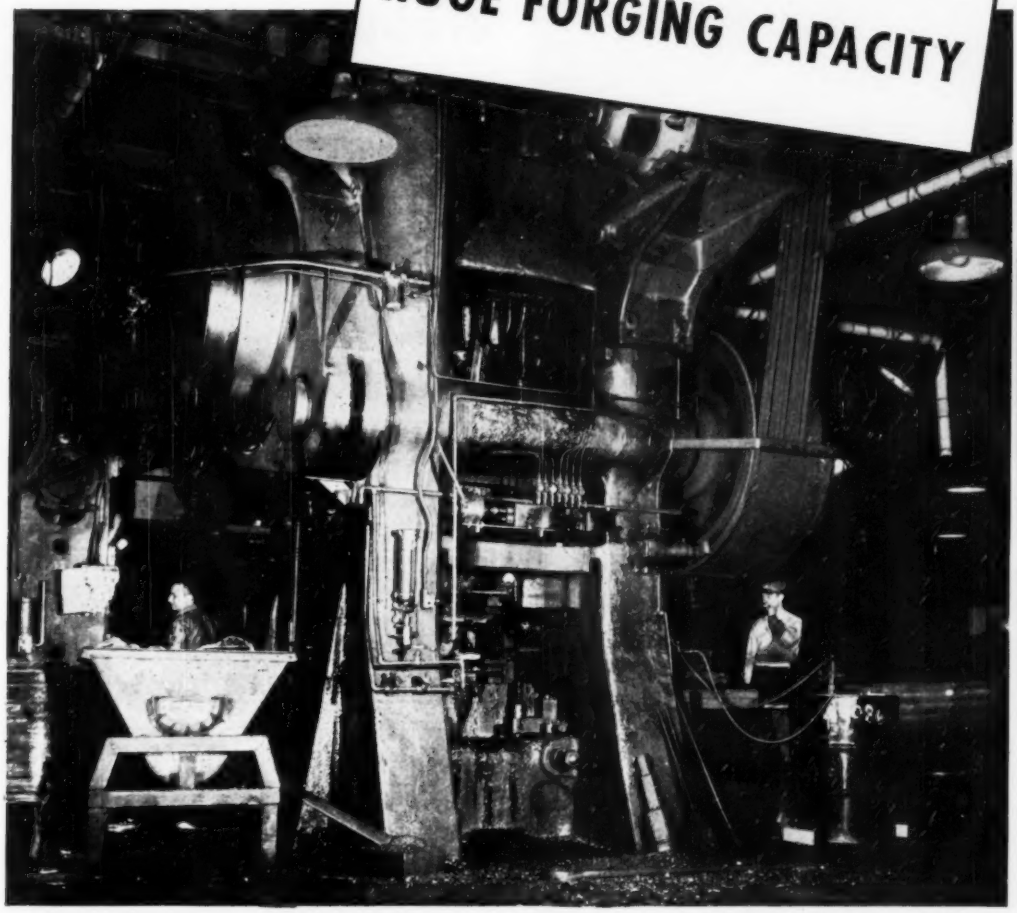

This 1500-ton hot forging press is among the huge battery of modern equipment in The Willys-Overland Forge.

The Willys-Overland Forge has capacity to produce *80 million pounds* of quality forgings a year . . . ample for your forging needs and the demands of many new customers.

Before placing your next order for forgings, check with The Willys-Overland Forge. You may realize substantial savings in better forgings more adaptable to your specific requirements.

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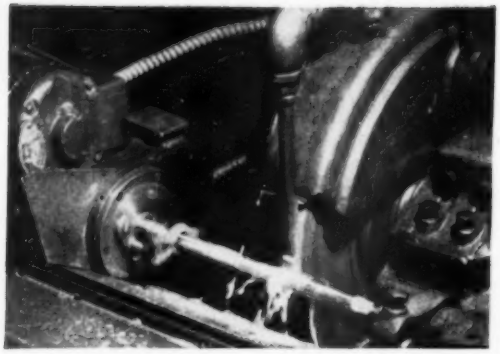

The Monthly Robertson Bulletin

CYLINDRICAL GRINDING IN THE TOOL ROOM

THE LARGE VARIETY OF WORK to be ground in tool rooms—and the many types of metal used—demand a universal free-cutting wheel that will remove stock fast and give the desired high finish. Such a wheel is the Robertson "Cool-Cut." Its revolutionary "open" structure permits cool cutting even on the hardest metals, with finishes well above production standards.

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For faster and more accurate tool-grinding—for any grinding job, big or small, and especially the tough ones—specify Robertson. Whether they're vitrified or resin-bonded, Robertson Grinding Wheels enable you to buy production time.

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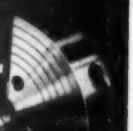

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(The product of Oilgear's superior design and engineering)

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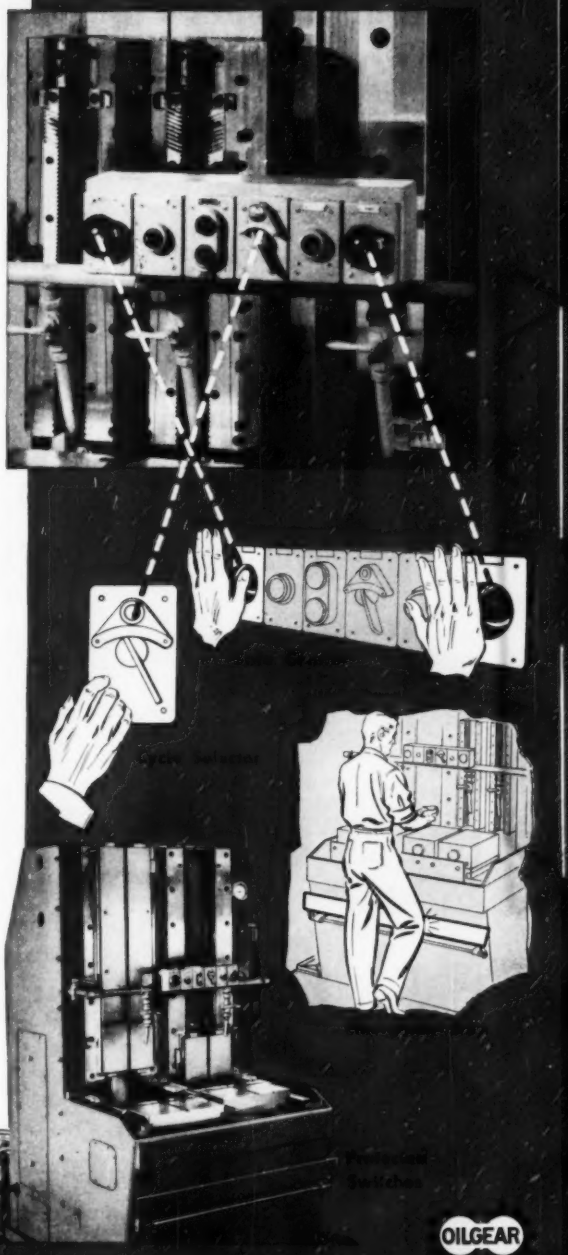
PROTECTED SWITCHES. Limit switches are mounted inside machine; protected from cutting fluid, chips, shop dust and other causes of damage. Relays are concealed in control panel on side of frame for easy inspection.



These are only a few of the many exclusive features of Oilgear Fluid Power Variable Speed Broaching Machines. Write for complete descriptive bulletins. THE OILGEAR COMPANY, 1563 W. Pierce St., Milwaukee 4, Wisconsin.

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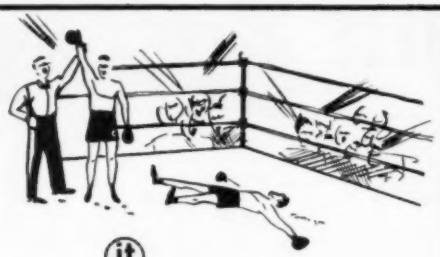

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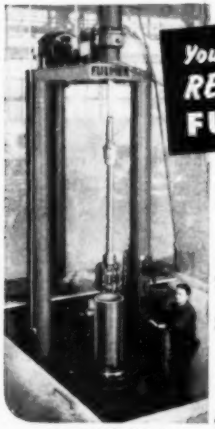

Fulmer Model 20-72 honing large Diesel liner.

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5.06" bore x 6.43" length x .040" thick. .005" of stock is removed to ±.00025" tol. in less than 1½ minutes per piece.

2 **GAS ENGINE CYLINDERS**
11" bore x 30" length. .008"-.012" of stock is removed in 4 to 5 minutes.

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Two 4.250" bores, in line, each 6" in length. .005" of stock is removed with surface finish of 10-12 micro-inches in 1 minute. Saved 90% on production time, improved finish 1000%, over previous reaming operation.

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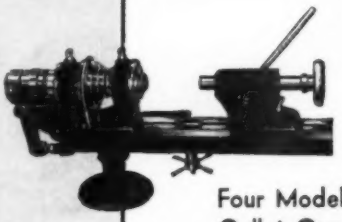

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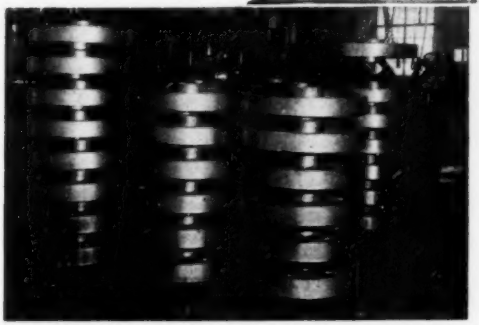

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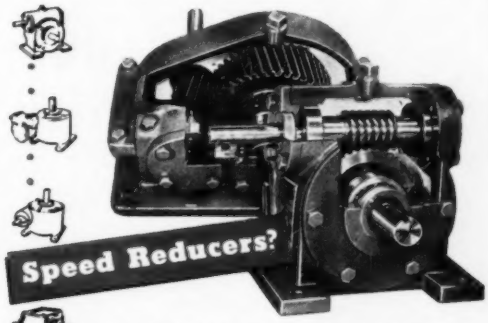

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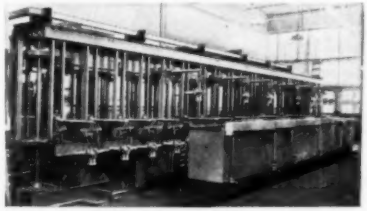

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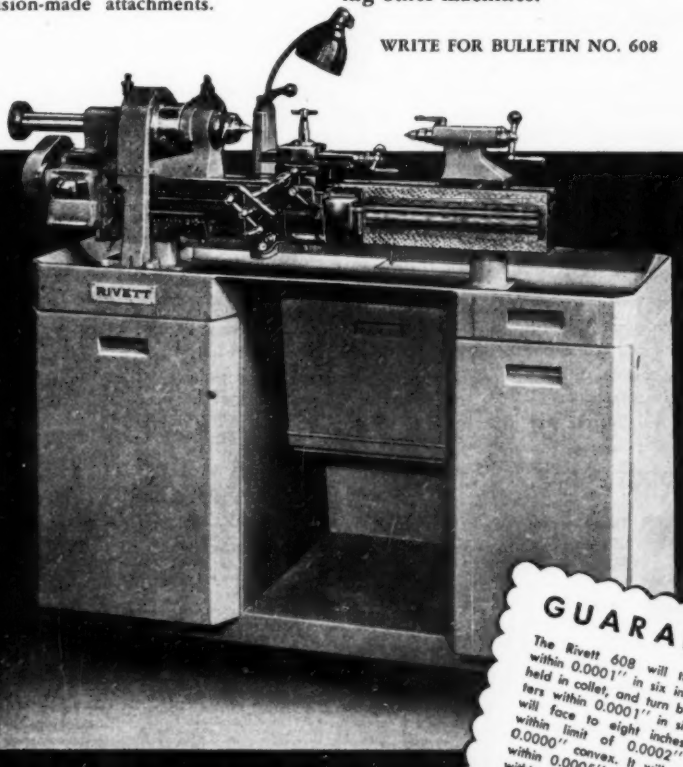
The Rivett No. 608 back-geared, screw cutting lathe for tool making and instrument shops, handles an endless variety of jobs in minimum time. This small but exceedingly proficient lathe with slide areas equal to that of one twice its size, permits the operator to finish his work completely without employing other machines.

WRITE FOR BULLETIN NO. 608



GUARANTEE

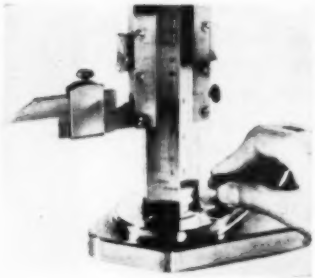
The Rivett 608 will turn or bore within 0.0001" in six inches — work held in collet, and turn between centers within 0.0001" in six inches. It will face to eight inches diameter within limit of 0.0002" concave, 0.0000" convex. It will cut threads within 0.0005" in twelve inches, or within 0.0003" in any three inches, or within 0.0002" in any inch of a specimen piece.

RIVETT LATHE & GRINDER INC.

BRIGHTON, BOSTON, MASS., U. S. A.

SCHERR *aids to precision – production*

CHESTERMAN HEIGHT GAGE



Measures Height to 48"

in largest size. Other sizes from 12" up. Here is an invaluable tool, unique in many features. Quick vertical rough adjustment, with final adjustment by micrometer screw operated by knurled nut in base, preventing shifting or movement of the tool (see picture). This is a big, heavy stabilized instrument that makes vertical measurement quick and sure. Vernier is large, 2½" long, much easier reading than the short vernier usually provided on this type of tool. Calibrations are in both English and metric, one set on each face of the column. This is a superior tool in every respect. Details and moderate price will interest you. *Write.*

GAGE BLOCK UTILITY SET

These adjustable gage block holders greatly enlarge the usefulness of your standard blocks. The set includes four holders—2", 4", 8" and 12", two jaws each for inside and outside measurements, a 60 deg. center point, and a substantial height gage base. Every shop can profitably use one or more of these economically-priced sets.

Write for full details on these tools, and for the Scherr Small Tool Catalog.

GEO. SCHERR CO., Inc.
200-D Lafayette St. New York 12, N.Y.

UNUSUALLY RAPID UNIFORM HEATING AND MARKED ECONOMY OF OPERATION

WITH **NEW**

COOLEY INDUSTRIAL ELECTRIC FURNACES

Supplied as complete units ready to go into operation, these new Cooley Industrial Box Furnace Models BL-1, 2, and 3 embody many new design features that provide unusually rapid, uniform heating with marked economy of operation.

The Cooley type heating elements have heavy resistors embedded in rectangular ceramic slabs. The side elements are so placed as to provide air space behind, above and below them forming baffle walls and creating a natural convection when heated, which equalizes furnace temperatures.

Cooley Model BL-1 Electric Box Type Furnace, with indicating recording controller mounted in integral panel, completely wired ready to go into operation. Maximum temperature 1850°F.

As the convected currents remove heat from all sides of the elements the result is a lowering of resistor temperature and an appreciable increase of element life. This feature has been in operation for many years on the manufacturers own production and has rendered almost trouble free operation ,nder the most extreme conditions and high temperatures.

NEW DOOR ACTION PERMITS FULLY INSULATED FRONT END

A distinctively new door mechanism permits the use of a large door which completely covers the operating end of the furnace, and insulates this section equally with the other furnace walls. Counterweighted and mounted on anti-friction bearings, the door may be raised with the finger tips and it closes gently and firmly against the furnace face without jar or shock. It makes the use of a heavy fire brick throat with its resultant heat losses unnecessary. Foot treadle operation can be supplied when specified. Convection in the furnace and the overall insulation of the front end produce a marked economy of power.

EASILY REPLACEABLE HEATING ELEMENTS

The door can be raised to the full limit permitting the removal of any of the heating elements from the front after disconnecting two terminal connectors. There is no need for furnace dismantling to make normal repairs.

Cut-away view shows new method of installing Cooley heating elements to produce natural thermal convection — provides rapid uniform heating.

FULL AUTOMATIC CONTROL IN COMPLETELY WIRED PANEL

All standard types of controlling pyrometers are available, furnished in a completely wired control panel, integral with the furnace when mounted or for use on floor panels or wall mounting.

THREE SIZES; MODELS:	BL-1	BL-2	BL-3
Chamber Sizes; 12"W x 8"H	18"L	24"L	36"L
Power Rating	11.5 KW	14 KW	18 KW

OTHER COOLEY ELECTRIC FURNACES

CHAMBER	8"W 6"H 14"L				10"W 6"H 18"L				8"W 6"H 14"L		10"W 6"H 14"L	
MAX. TEMP.	1850° F.				1850° F.				2000° F.		900° F.	1200° F.
AMPERES	14.8 at 230 v.				19.6 at 230 v.				20.2 at 230 v.		17.5 at 230 v.	17.5 at 230 v.
WATTS	3400				4500				4650		900 Max.	1200 Max.
MODEL*	M H-3	V H-3	M K-3	V K-3	M H-4	V H-4	M K-4	V K-4	V K-5	V K-6	ACL	ACH
PRICE	200 00	230 00	250 00	280 00	295 00	325 00	345 00	375 00	420 00	340 00	385 00	410 00

* M models complete with hinged door and hearth plate. V models have counterweighted vertical lift door. K and AC air circulating with built-in fan; models include Selective Power Modifier for input control to correct temperature lag. Also pot type furnaces for hardening and tempering to 1650° F. Write for data and prices.

ACCESSORY EQUIPMENT — All standard makes of controllers are available. Prices complete with Thermocouple and lead wire range upwards from $161.00
Enclosed Panel containing controlling pyrometer, line switch and fuses with steel stand completely wired, range upward from $291.00
Steel stand with shelf $50.00

SIMPLE HEAT TREATING INSTRUCTIONS — Cooley Engineers have prepared simple heat treating instructions which are so designed that anyone can perform heat treating, hardening, tempering, drawing, and annealing operations on a wide range of steels and other materials. They are sent with each Cooley Furnace or are available upon request.

FREE LITERATURE

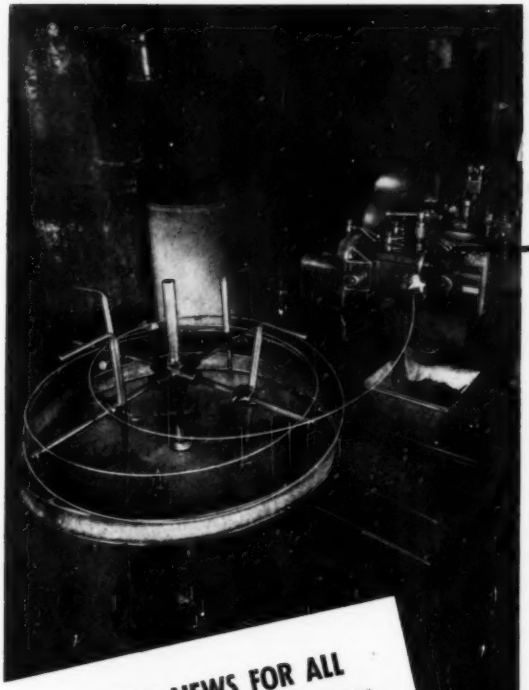
New catalog completely describes all models and applications of each. Write today for your copy, no obligation.

COOLEY ELECTRIC MANUFACTURING CORP.

48 SO. SHELBY ST. • INDIANAPOLIS 7, IND.

"LEADERS IN SMALL ELECTRIC FURNACE MANUFACTURE"

Indianapolis Machinery Export Corporation, Export Manager, 44 Whitehall Street, New York, New York



NOW . . . there's a big change in this picture

And you see it in quicker P-K Self-tapping Screw deliveries

REMEMBER THIS PICTURE? We used it in an August, 1946 advertisement to illustrate the serious shortage of raw materials, a main reason why deliveries of P-K Self-tapping Screws were so slow.

Now, there's a big change. Supplies of steel wire are almost normal. Backlogs have been worked down. Stocks have been built up. As a result, on most sizes of screws, in all types, prompt deliveries are again being made.

Today, there is no longer any reason why any manufacturer need accept a substitute when he wants P-K Self-tapping Screws. Parker-Kalon Corporation. 200 Varick Street. New York 14, N. Y.

GOOD NEWS FOR ALL USERS OF PARKER-KALON SELF-TAPPING SCREWS

YOU'RE *O-K* WITH *P-K* ... THESE *EXTRAS* PAY

- ORIGINATORS OF SELF-TAPPING SCREWS
- ONLY COMPLETE LINE
- 35 YEARS' APPLICATION EXPERIENCE
- EXPERT ASSEMBLY ENGINEERING
- UNSURPASSED QUALITY CONTROL LABORATORY
- LARGEST PRODUCTION FACILITIES
- TOP-RATED DISTRIBUTORS EVERYWHERE

AVAILABLE THROUGH P-K ACCREDITED DISTRIBUTORS

PARKER-KALON
Original
SELF-TAPPING SCREWS

FOR EVERY METAL AND PLASTIC ASSEMBLY

OTHER PARKER-KALON PRODUCTS: Cold-Forged Socket Screws, Wing Nuts, Thumb Screws Hardened Screwnails and Masonry Nails - Stur-Grip File and Solder Iron Handles Metal Punches - Damper Regulators and Accessories

There's a Walker Magnetic Chuck for Every Known Application . . .

Twenty-three sizes of WALKER Magnetic Chucks—giving you a wider scope of production on either light hand-operated or power-fed machines.

Walker Chucks save operational time, eliminate need for costly and time-consuming clamps and work-holding fixtures.

Walker Chucks now in the following types and sizes:

PERMANENT TYPE			SWIVEL TYPE	ROTARY TYPE
4⅜" x 7"	6" x 12"	10" x 15"	4" x 8"	4" 12"
4" x 8"	6" x 18"	10" x 24"	6" x 18"	6" 14"
5" x 10"	8" x 18"	12" x 24"	8" x 24"	9" 16"
6" x 11"	8" x 24"	12" x 36"		10"
	8" x 36"			

Hold Everything with Walker Chucks

O. S. WALKER CO. Inc.

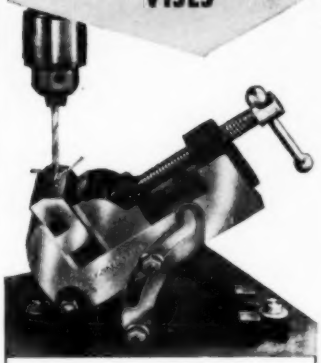
WORCESTER 6, MASSACHUSETTS

Original Designers and Builders of Magnetic Chucks

More men pay to read American Machinist than any other metalworking publication—by many thousands.

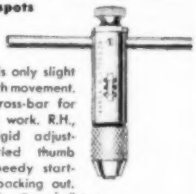
Jig in a Jiffy

"YANKEE" ANGLE VISES



Easily converted to fast-acting, economical jig. Shortcuts costs on small jobs. Lock the work in the "Yankee" Angle Vise. Tilt for the angle and lock. You're set up for every operation . . . hand or machine. Also available with quick-release swivel base. Two jaw widths . . . 2" and $2\frac{3}{4}$". Each vise supplied with grooved "V" Block for holding rounds.

"Yankee" Ratchet Tap Wrenches for tight spots



Ratchet needs only slight back and forth movement. Adjustable cross-bar for close-quarter work. R.H., L.H. and rigid adjustments. Knurled thumb piece for speedy starting in and backing out. Two lengths for 0 to $\frac{5}{16}$" taps, one for 0 to $\frac{3}{16}$" taps.

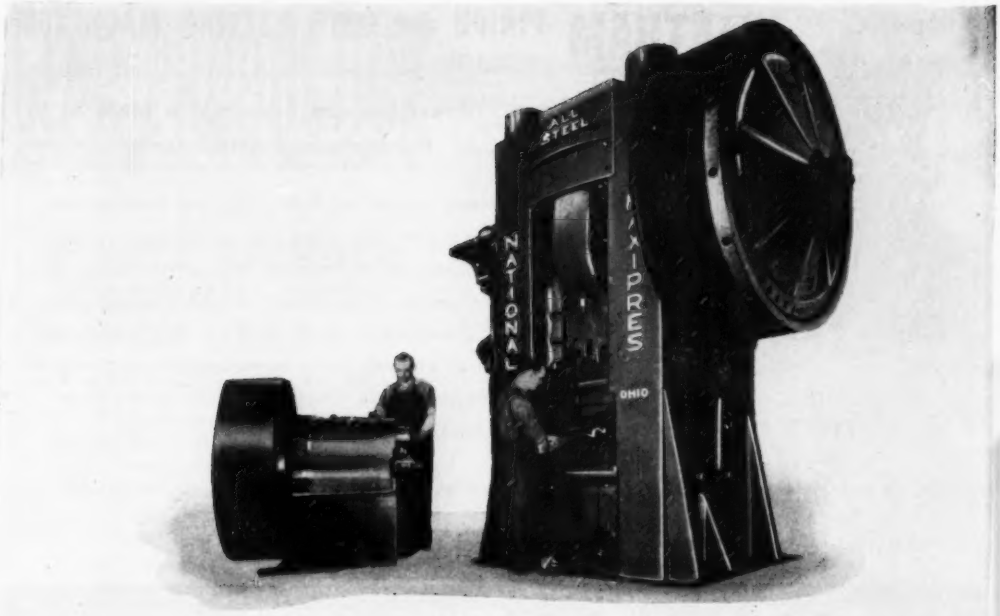
Write For "Yankee" Tool Book

NORTH BROS. MFG. CO.
Philadelphia 33, Pa.

"YANKEE" TOOLS NOW PART OF

STANLEY

THE TOOL BOX OF THE WORLD



HOW TO MAKE BETTER FORGINGS FASTER AT LESS COST!

STEP ONE—Pre-form your forging blanks on National's new REDUCEROLL, illustrated at left above.

This machine, which can be fed from front or rear, eliminates costly fullering and edging operations, distributes the metal accurately free of shuts or folds by fast, simple rolling—an unskilled operation.

Low cost, quickly interchangeable rolls make a wide variety of sizes and shapes practical even on short runs.

Rugged construction permits large reductions in area. Portability makes the REDUCEROLL a "roving" tool.

STEP TWO—Forge the uniformly superior REDUCEROLL blanks in the National MAXIPRES on the same heat!

RESULTS—Save material, extend your forging equipment's range, increase production, produce better forgings and prolong die life!

National Engineers are at your disposal to help you investigate the application of the REDUCEROLLING technique to your forging problems.

75th Anniversary 1874-1949

NATIONAL
MACHINERY COMPANY
TIFFIN, OHIO.

DESIGNERS AND BUILDERS OF
MODERN FORGING MACHINES—MAXIPRESSES—COLD HEADERS—AND BOLT, NUT, RIVET AND WIRE NAIL MACHINERY

New York Detroit Chicago

WALTHAM PINION and GEAR CUTTING MACHINES

Precision and Economy in Mass Production of Small Parts

Specially designed for high speeds and close accuracy, cutting straight teeth in fine pitch pinions, gears for small mechanisms, Waltham Machines are fast, convenient and time-proved on a wide range of work. In all types the same cutting method is employed, by which successive cuts are made by a revolving cutter, blanks being held and indexed by the work spindle. Special cutters furnished to customers' specifications.

Write for illustrated literature giving detailed description and specifications.

TYPES AVAILABLE

Single Cut Pinion Machines—employing one cutter
Multiple-Cut Pinion Machines—employing 2 or 3 cutters
Magazine-Fed Pinion Machines—fully automatic
Gear Cutting Machines—single and multiple cut types

WALTHAM MACHINE WORKS
HIGH STREET, WALTHAM, MASS.
WALTHAM TRADE MARK REGISTERED U.S. PAT. OFF.

KICK THE GREMLINS OUT OF PRECISION LAPPING

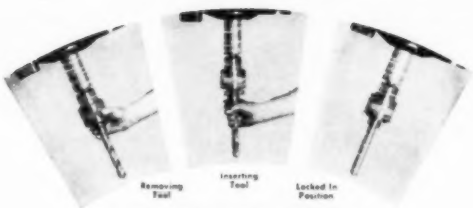
GET THIS VALUABLE TRIAL KIT ABSOLUTELY FREE!

PROVE THEM AT OUR EXPENSE!

The solution to your toughest tool room lapping problem probably lies in one of these 6 sample jars. Just try these *finer*, fine grit compounds at our expense. Kit mailed free anywhere in the United States. No obligation.

OFFER LIMITED... WRITE TODAY!

UNITED STATES PRODUCTS CO.
518 MELWOOD ST. PITTSBURGH, PA.



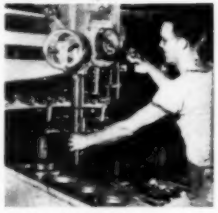
McCROSKY

WIZARD Quick-Change CHUCKS

Speed Up Tool Changes

● There's no stopping the spindle for tool changes when you use McCrosky Quick-Change Chucks. The operator simply grips the chuck lightly, and the drill with collet drops down into his hand. The tool for the next operation is then pushed up into the revolving chuck—is *centered automatically*—and *locked rigidly* in position.

Try them once,—and you'll use them thereafter for all drilling and tapping operations.



COST CUTTING TOOLS

Bulletin No. 17-C { Gives full details Send for a copy

McCROSKY TOOL CORPORATION MEADVILLE, PA.

Jack-Lock® MILLING CUTTERS
Adjustable BLADE REAMERS
Quick-Change CHUCKS
Turret TOOL POSTS
Block Type BORING BARS
SPECIAL *Multiple Operation* TOOLS

No. 101

GEAR PRODUCTION HIGHLIGHTS

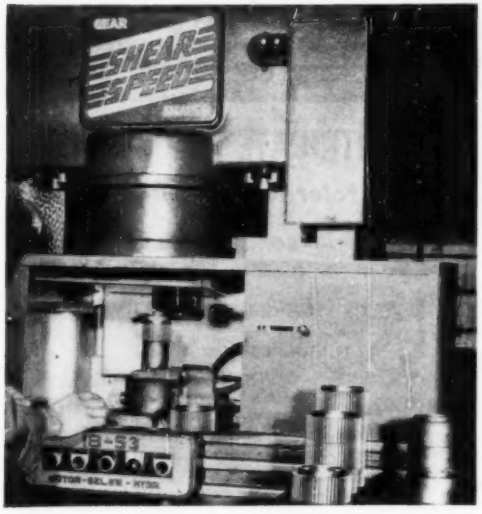
Cutting-Shaving-Checking-Lapping

MICHIGAN TOOL COMPANY
7171 E. McNICHOLS RD. • DETROIT 34, MICH.

SINGLE SPINDLE MACHINE CUTS 4-INCH GEARS IN 33 SECONDS EACH

With 2200 gears cut per tool grind—equal to over 100,000 gears per set of tools—a well-known gear producer is getting an average of 550 gears per shift from a single Michigan Shear-Speed gear shaper. The gears are 4-inch diameter, 51-tooth, $1\frac{1}{2}$ inch face. Floor to floor time is 45 seconds.

No coolant is used in cutting these high tensile iron gears*. Tools have a negative rake of 3°.

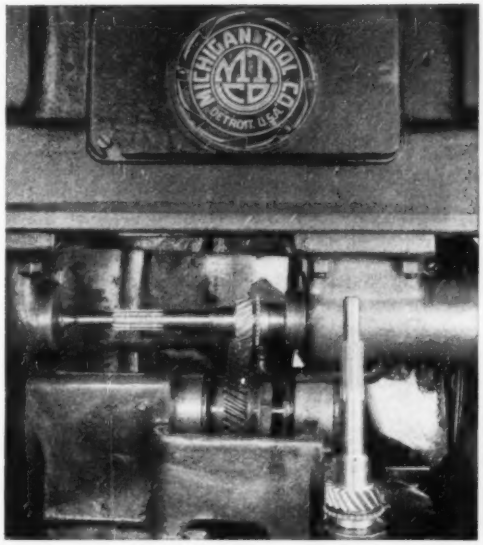


Tool design is such that four different gears—of varying face widths—can be cut on the same machine with the same tooling.

With the previous method of hobbing these gears, production from eight spindles was approximately 370 gears per shift. In addition, about 1 hour per day was required for tool sharpening.

*Higher outputs per grind can be obtained with straight casti ron gears.

For machine details, write Michigan Tool Company for Bulletin SS-48.



CUT FINISHING TIME IN HALF FOR TRUCK GEARS (now 32 seconds each)

"Underpass" shaving—in which the cutter travels back and forth just once—has not only cut overall tool cost per gear and eliminated cutter breakage on shoulder gears, but has reduced finishing time to only 32 seconds (floor-to-floor) per gear.

Typical of the gears (for a popular truck) being cut on these Michigan machines is a 17-tooth shoulder gear with 34° helix angle, 7.954 diametral pitch, 20° pressure angle, and pitch diameter of 2.137 in.

Material is SAE 4027, and the gears come to the "Underpass" shavers with between .006 and .008 in. stock, measured over pins.

For details of latest Underpass finishers, write Michigan Tool Company for Bulletin No. 870.

For Perfect Drill Points

Use The OLIVER "510"

OLIVER OF ADRIAN

The point on your drill can't be **too good**—the better the point, the faster production and the greater savings in time and labor. (Lower drill costs—less scrap—less down time.)

Oliver "510" sharpened drills are **theoretically correct, practically** perfect*, and all drills sharpened are uniform.

Send us a few of your drills to sharpen at no cost or obligation. We feel certain that you will concede them to be the last word in "drill point grinding."

*As stated by a competent authority—name on request.

Write also for literature and prices—the moderate cost will please you.

OLIVER INSTRUMENT CO.
1414 E. Maumee • Adrian, Michigan

IMPROVE YOUR TOOLROOM IT'S THE BACKBONE OF PRODUCTION

OLIVER OF ADRIAN

AUTOMATIC DRILL GRINDERS · TOOL & CUTTER GRINDERS—DRILL POINT THINNERS—TEMPLATE TOOL GRINDERS—FACE MILL GRINDERS—DIEMAKING MACHINES

KEYSEATING
The Modern Way

Illustration shows typical set-up for cutting taper keyways with table tilted.

Machines are made in three sizes for keyways 1/16" to 1¼" in width.

Great simplicity and ease of operation of Davis Keyseaters assure the user of accurate, time saving work.

Let our engineer study your keyseating problems.

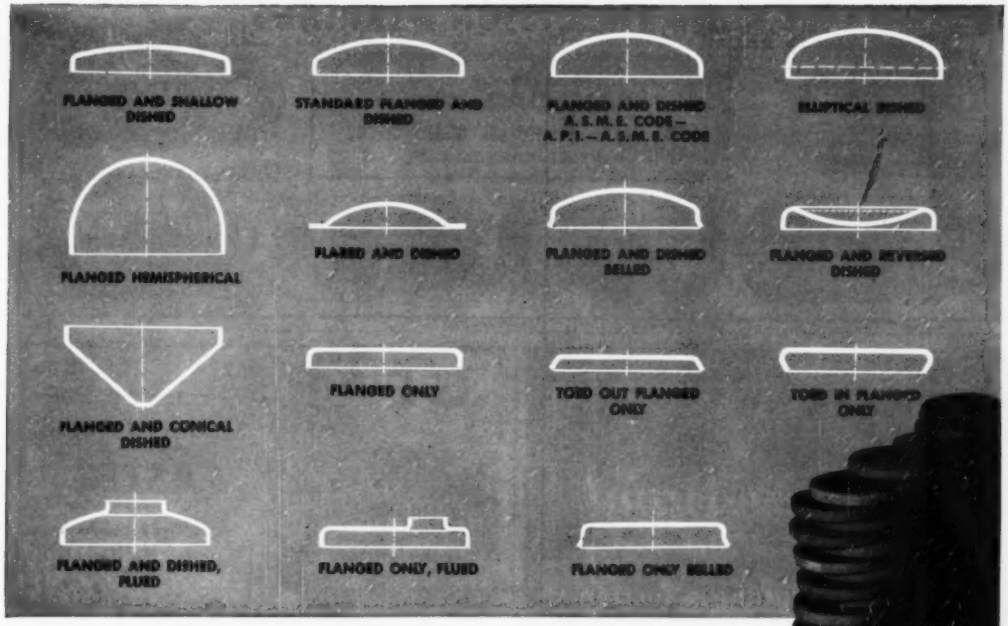
DAVIS KEYSEATER COMPANY
403 EXCHANGE ST. ROCHESTER, N. Y.

FOR INTRICATE FORM-TOOLS
—close tolerances—quick delivery
—send specs to J & S

J & S Tool Company makes the most intricate types of form-tools to the closest tolerances for many of the leading manufacturers. Among the types that we produce are: counterbores, broaches, circular form-tools, hollow mills, gun drills, flat drills, end cutters, boring tools, step drills, watch tools, cold heading dies, recess tools, spiral form-tools, taper reamers, etc. *Save time and money by sending your specs to J & S.*

• *Also manufacturers of Fluidmotion and Form Master Radius and Angle Dressers.*

J&S TOOL CO., INC.
479 Main Street, East Orange, N. J.
Representatives in Principal Cities


FLANGED AND SHALLOW DISHED
STANDARD FLANGED AND DISHED
FLANGED AND DISHED A. S. M. E. CODE — A. P. I. — A. S. M. E. CODE
ELLIPTICAL DISHED
FLANGED HEMISPHERICAL
FLARED AND DISHED
FLANGED AND DISHED BELLED
FLANGED AND REVERSED DISHED
FLANGED AND CONICAL DISHED
FLANGED ONLY
TORD OUT FLANGED ONLY
TORD IN FLANGED ONLY
FLANGED AND DISHED, FLUED
FLANGED ONLY, FLUED
FLANGED ONLY BELLED

WRITE or *WIRE* LUKENS ...if you're needing HEADS

Lukens can ship many sizes of Standard and ASME carbon steel heads from stock at Coatesville, Pennsylvania; listed in Bulletin 433. Hundreds of dies are available for producing others within a short time after your order is received.

Look at the variety of heads produced by Lukens, illustrated above; every shape and style you can possibly need. Their dimensions and properties are given in Lukens Catalog No. 1, which will be sent to you upon request. Lukens makes heads from as small as four inches to over twenty feet in diameter, or as thick as six inches.

Heads are made of carbon and alloy steels, including stainless; of nonferrous metals such as nickel, Monel and Inconel, aluminum and silicon bronze; and the widest selection of corrosion-resistant clad steels available anywhere. Choose the metal that will do your job best and Lukens will make the heads.

For copies of Lukens publications or for a quotation on your head requirements, write Lukens Steel Company, 478 Lukens Building, Coatesville, Pennsylvania.

LUKENS HEADS

"Head Work", a 16mm motion picture in sound and color, on spinning and pressing of Lukens Heads is available without charge. Running time: 27 minutes. Write for a booking date.

FOUR INCHES TO OVER TWENTY FEET IN DIAMETER

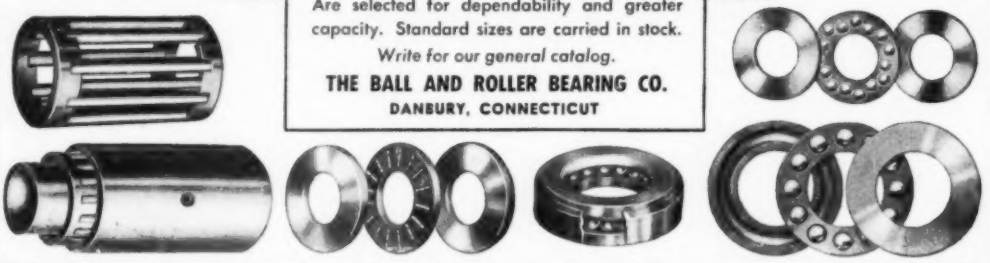
• • SPEED SCRAP TO THE MILLS TO MAKE MORE STEEL • •

B & RB Precision Bearings

Are selected for dependability and greater capacity. Standard sizes are carried in stock.

Write for our general catalog.

THE BALL AND ROLLER BEARING CO.
DANBURY, CONNECTICUT



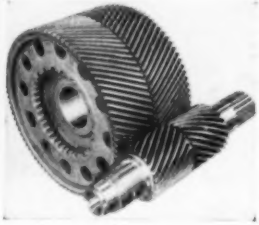
THE *Helping Hand* IN Precision Hardness Testing

• WILSON has maintained and continues to maintain Field Service Engineers who are hardness testing specialists. Their responsibility is to (*1*) study users' requirements, (*2*) recommend equipment that will serve best, (*3*) see that it is correctly installed and (*4*) that it *continues* to give dependable service.

We are originators, exclusive makers of "ROCKWELL" Hardness Testers, "ROCKWELL" Superficial and TUKON Microhardness Testers. Our years of developing and improving hardness testing equipment give our factory-trained representatives background for best possible service to you.

WILSON
MECHANICAL INSTRUMENT CO., INC.
AN ASSOCIATE COMPANY OF AMERICAN CHAIN & CABLE COMPANY, INC.
ACCO
230-B PARK AVENUE, NEW YORK 17, N. Y.

GEARS made to your SPECIFICATIONS FASTER at Lower Cost

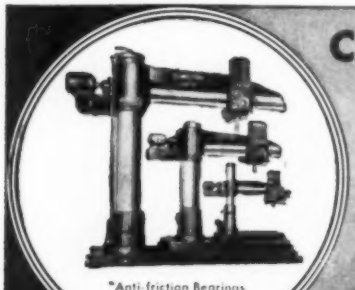


CAPITOL GEARS are cut exactly to your specification faster and at a minimum cost to you.

Over 40 years experience have made CAPITOL famous for quality materials, precise workmanship and dependable performance. Modern shop facilities are available for cutting—SPUR • BEVEL • HELICAL • HERRINGBONE • MITRE and other types of gears. Large gears for heavy machines or small for timers, cameras, etc. You can depend on CAPITOL gears for long hard service.

SEND YOUR PRINTS TODAY for money and time saving quotations.

AUTO ENGINE WORKS, INC.
341 A N. HAMLINE AVE. ST. PAUL 4, MINN.



CARLTON RADIAL DRILL

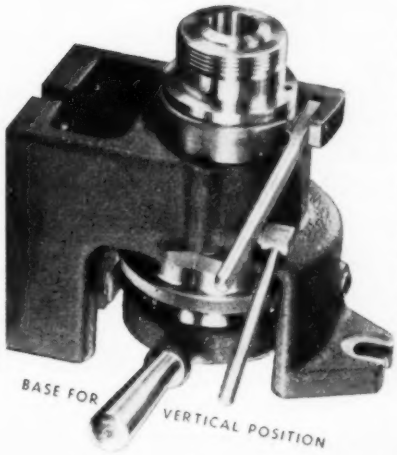
FEATURES: 1. Low Hung Drive to Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all Speeds. 4. Concentrated and Convenient Push-button Controls. 5. Constructed on Unit Principle.

THE CARLTON MACHINE TOOL COMPANY

CINCINNATI 25, OHIO, U. S. A.

HARDINGE HORIZONTAL - VERTICAL

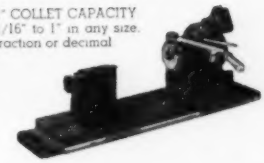
Collet Index Fixtures with Threaded Nose Spindle are fast in operation and hold work accurately



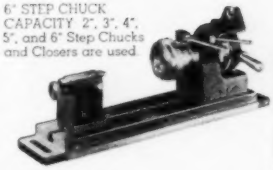
In addition to taking standard collets, this fixture takes step chucks and jaw chucks to cover a wide range of applications. It will eliminate the necessity of your tool room making many specially designed fixtures. Thus, your engineers and tool-makers will have more time for other work.

A preselector arrangement provides the selection of separate indexing of any number divisible into 20 or 24. The collet closer lever has a 100 to 1 leverage for quick opening and closing of collets and step chucks. Write for bulletin.

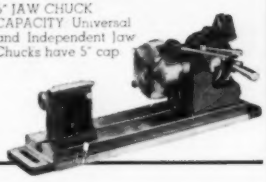
1" COLLET CAPACITY 1/16" to 1" in any size, fraction or decimal



6" STEP CHUCK CAPACITY. 2", 3", 4", 5", and 6" Step Chucks and Closers are used.



5" JAW CHUCK CAPACITY. Universal and Independent Jaw Chucks have 5" cap.



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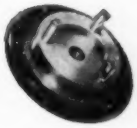
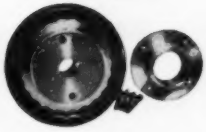


For TAPERED KEY-DRIVE SPINDLES

For THREADED NOSE SPINDLES



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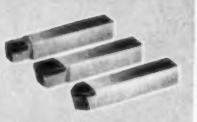

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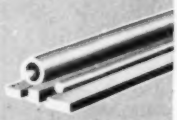

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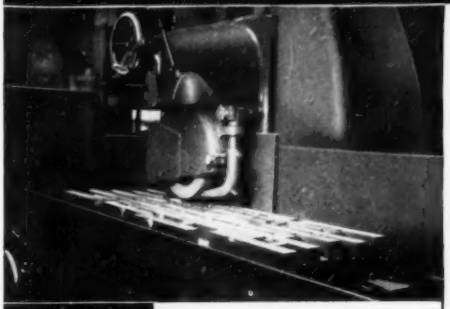
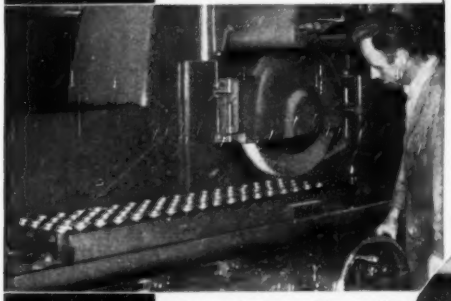


● Cross Slide Draw Bars formerly ground 5 pieces at a time. Now ground on a Mattison Grinder 27 pieces per load. 50% time saving.

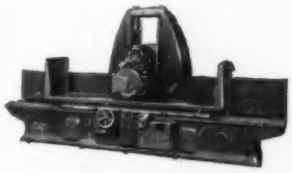


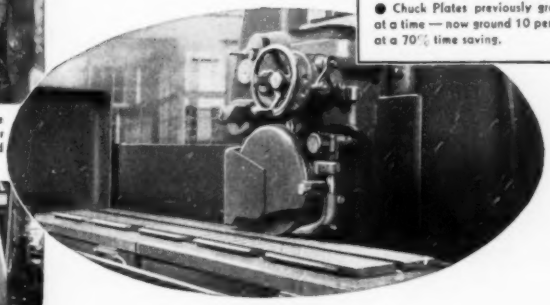
● Caps previously ground few at a time on small grinder. Now, Mattison Grinder handles 75 at a time. Time was reduced from 7 hours to 30 minutes.

● Head Slide Guides formerly ground one at a time in 36 minutes — Now ground on a Mattison Grinder 9 pieces per set-up at a 77% time saving.

Examples: Grinding 75 pieces per load instead of 18 — cut time 80% . . . . . 10 pieces per load instead of 2 — cut time 70%, etc.

Jobs shown indicate the possibilities for increased production by handling large quantities per set-up. In your efforts to obtain maximum production and lower cost, it will pay you to check into the capabilities of the Mattison Grinder.





● Chuck Plates previously ground 1 at a time — now ground 10 per set-up at a 70% time saving.

ADDITIONAL INFORMATION

Also available is free Set-Up Book showing further examples of work ground on Mattison Grinders — Send for a copy today.

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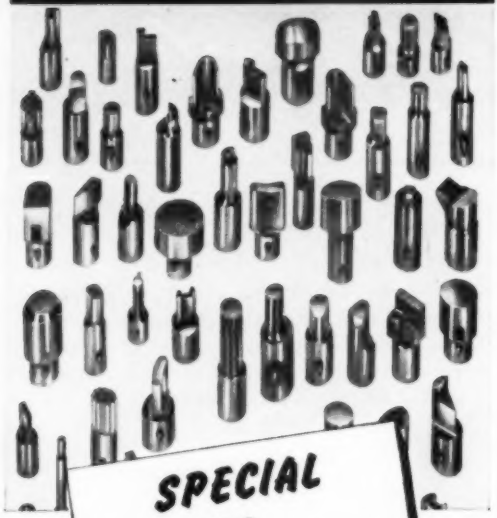

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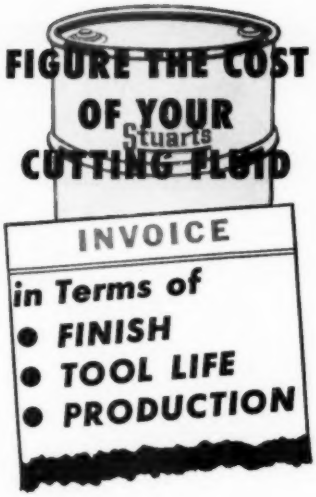

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TUBULAR RIVETS — (eyelets) 3½/16—3740. — 4/16—3739.—4/16—3741. Large quantities, chrome-plated, steel. Tubular Rivet & Stud Co. ½ reg. price.

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900 SO. 7th ST., ST. LOUIS 2, MO.

FOR SALE

One used 150 ton overhead traveling crane with two 75 ton trolleys, DC operated with rotary converter. 68'6" span, good condition, available at once loaded on cars.

THE ENGINEERING EQUIPMENT COMPANY
Cheney Ave., Marion, Ohio

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HAMILTON 8744-45

FALK
MACHINERY COMPANY

18 WARD ST.
ROCHESTER 5
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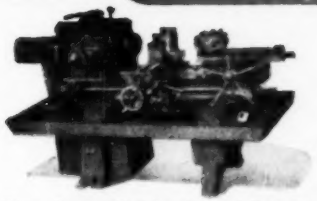
Every Item Guaranteed as Represented



Warner Swasey #3 Universal Geared Head Bar Feed Ram Type Turret Lathe. Late Type. 3/60/220/440 volts motor. FIVE AVAILABLE—some have tooling.

TURRET LATHES

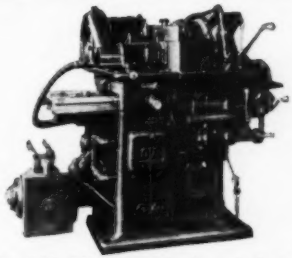
Morey #2 Geared Head 1" Cap., M. Dr.
Simmons Microspeed 1" Cap., M. Dr.
Oster #601 Hand Screw Machine 1½ cap.
W-Swasey #4 Univ. 1¼" cap., M. Dr.
Jones & Lamson #3 Univ. Bar Feed, 1½"
W-Swasey #3 Univ. 1½" cap., M. Dr.
Gisholt #4 Univ. 2" cap., M. Dr.
W-Swasey #2A Univ. 2½" Cap., M. Dr.
Bardons & Oliver #7, Univ. 2½" Cap.
W-Swasey #3A Univ. 3½" cap., M. Dr.

Buffalo #0 Bending Rolls. Pinch Type, motor driven. With formers for bending angles, rounds, squares, pipe.
Buffalo #1 Wrapping Rolls. Motor driven. Capacity— 3½x3/8x9
Niagara Initial Type. 12'x1/16" capacity.
Webb #2L 5'x10ga. Initial Type Bending Rolls. 5 h.p.

Barnes #307 Single Spindle Hydraulic Twin Cylinder Vertical Honing Machine. Late Type complete with coolant system and 220/440 volts motors and controls. Six speeds, #5 morse taper. TWO AVAILABLE. One has Positive Depth Stop & Dwell Mechanism.

ENGINE LATHES

36"x30' LeBlond Geared Hd. Motor Dr.
32"x16' Bridgeford, Geared Head, M. Dr.
28"x10' Davis Quick Change Gear
26"x18' Bridgeford, Geared Head, M. Dr.
25"x14' LeBlond Motorized
24"x16' American Q.C.G. Grd. Hd. 11' centers, Taper Attach. Motor Dr. Equipment
24"x14' Lodge & Shipley, Motorized
24"x16' American Motorized
24"x12' Putnam, Quick Change Gear
24"x10' LeBlond, Quick Change Gear
21"x18' LeBlond, Motorized
20"x11' Schumacher-Boye, Q.C.G.
20"x10' American, Q.C.G. 72" centers
20"x10' Hendey, Q.C.G. motor dr.
20"x8' Lodge & Shipley, Q.C.G. M. Dr.
18"x8' Davis Q.C.G. 42" centers, equipment
18"x8' Lodge & Shipley, geared head
18"x8' Hendey Q.C.G. 49" centers
18"x7' Lehman, Q.C.G. M. Dr.
18"x6' American, Geared Head, M.D.
16"x12' South Bend Q.C.G. Enclosed Head Underdriven with 1½ h.p. motor & controls. 105½" centers. NEW—1946. Has chuck, turret tool post, 2-steady rests, faceplates. Excellent condition. Immediate delivery from stock.
16"x8' Hendey Q.C.G. M. Dr.
16"x6' Lodge & Shipley Geared Head
16"x6' Lodge & Shipley "Patent Head", Motor Dr.
16"x6' South Bend Enclosed Head, Motor driven. Taper Attachment, Chucks, Collets & Quick Acting Collet Chuck.
14½"x6' South Bend Enclosed Head, Motor Driven. Taper Attachment, chucks, Turret Toolpost Threading Dial, Ram Type Turret Attachment, collets & Collet Chuck.
14"x8' Reed-Prentice Eight Speed Selective Geared Head, Q.C.G. Motor driven w/220/440 volts motor & controls. Has Taper Att. chuck, faceplates, steady rest, cabinet legs, max. centers —48". Completely rebuilt. Immediate shipment from stock.



Greenfield #12 Hydromatic Internal Grinder. Serial #11766. With Automatic Sizing Features. 7½ h.p. 3/60/220 volts motor.

GRINDING MACHINES

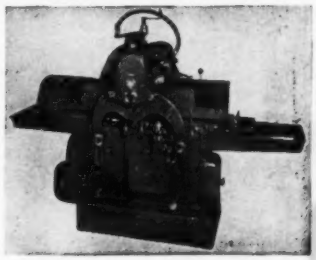
J & L #TG-615 Automatic Thread, M. Dr.
Norton 6x18 Vert. Surface, Excello Spindle
Norton 6x18 Horiz. Surface, Excello Spindle
Brown & Sharpe #2 Auto. Surface, 6x18
Pratt & Whitney 14x36 Vertical Surface
Blanchard #16, 26" Vertical Surface
Abrasive Automatic Surface 22x8
Reid #2 Automatic Surface, 6x18
Heald #25 Rotary Surface
Heald #70 Internal, Belt drive
Heald #60 Internal, Belt drive
Norton #2 Univ. Tool & Cutter, Belt Dr.
G & Livingston #4 Tool & Cutter
Cincinnati #2 Tool & Cutter, M. Dr.
Cincinnati "Monoset" Tool & Cutter
Cincinnati #2 Centerless, M. Dr.
Greenfield #12 Internal Hydraulic
Brown & Sharpe #10 Cylindrical 6x18
Brown & Sharpe #11 Cylindrical 10x30
Brown & Sharpe #4 Univ. Cylindrical 12x60
Brown & Sharpe #5 Plain Cylindrical
Oliver of Adrian #51 Drill Grinders
Thompson 6x18 Hydraulic Horiz. Surface. Wet & dry work. 220/440 motor driven. Auto. downfeed to head. Motor driven exhauster unit.
NEW—Leach 6x12 Horiz. Surface. 220 volts motor, ball-bearing Spdle. Permanent magnetic chuck. Immediate shipment from stock.
Norton 6x36 Horiz. Surface. 220/440 volts motor. Has extra grinding wheels and 40x9 chuck. For wet & dry work. Excellent condition.

AUTOMATICS

No. 0 & No. 00 Brown & Sharpe
No. 0 Brown & Sharpe Automatic Cutoff
#2G Brown & Sharpe High Speed Automatic Screw Machine. Serial #6814. Self-contained 5 h.p. 3/60/220/440 volts motor drive & controls. Complete coolant, toolposts, gears, collets. FOUR AVAILABLE.
#2 Brown & Sharpe Automatic. Turner drive 220/440 volts motor. With Stock stands, collet, toolposts, coolant system, change gears. FOUR AVAILABLE.
Cleveland Model "A" 3¾" capacity Single Spindle Motor Driven Automatic. Has lot of tooling, collets, motors and switches & coolant system.

PUNCH PRESSES

Niles Bement & Pond Horiz. Hydraulic Wheel Press. 200 tons capacity. 48" between strain bars.
Bliss #18, #20, #20B, #21 O.B.I. Motorized.
Ferracute #86 Wide Frame, motor driven. 61½" between housings. 13¾" stroke.
Michigan O.B.I. 36 tons cap. 2" stroke. Wide Ram, wide Bed. Motor driven
Lucas 15 tons, Power Arbor Press. M. Dr.
McCall No. 4 O.B.I. 2½" stroke, 25 tons.
NEW Johnson O.B.I. Presses. All sizes.
Bliss #305 Geared S.S. Single Action
Nilson 56 tons S.S. Dbl. Crank 3-Die Transfer Press
Toledo #5 O.B.I. 44 tons capacity.
Federal #3 O.B.I. 26 tons capacity.



Cincinnati #2-18 Automatic Horizontal Milling Machine. Late Type, Motor driven with motor and controls. Motor driven coolant system.

MILLING MACHINES

Nichols Hand, Late Type, M.D. (six)
Sundstrand #0 Rigidmil, M.D.
Whitney #6 Hand, Cone Drive
Hardinge B.B. Vertical, Bench
Becker #5C Vertical, Cone Dr.
Knight #1½C Vertical
Cincinnati #3 & #4 Vertical. Dial Type
Cincinnati #3, #4, #5 Pl. Horz.
Brown & Sharpe #12 Production. 18" Autom.
Brown & Sharpe #12 Production. 24" Autom.
Brown & Sharpe #0, 1, 1Y Horizontal
Kempsmith #1, #2 Plain Horiz.
Cincinnati 18" Mfg. Plain
Milwaukee #2K Vertical, M. Dr. H. Speed
Milwaukee #3K Vertical, M. Dr. H. Speed
Milwaukee #1½ Dbl. Overarm, Horiz.
Milwaukee #2B Dbl. Overarm, Horiz.
Milwaukee #3B Plain Horizontal
Pratt & Whitney #2 Duplex, Motorized
Cincinnati #0-8 Auto. Horiz. Some w/rise & fall spindle. FIVE AVAILABLE.
Cincinnati #0-8 Vertical. Motor driven. (EIGHT AVAILABLE)

UNIVERSAL MILLING MACHINES

Ames Bench, 12"x3"x7½"
Index #40H, 16"x8¼"x16"
B & S #2, 20"x5"x13¼"
B & S #1½, 20"x7"x18"
Bridgeport, 20"x9"x16"
B & S #1D, 24"x8"x15"
Garvin #2MU, 24"x8"x18"
K & T "Milwaukee" #2, 28"x10"x17"
Kempsmith #2, 28"x8½"x18"
Cincinnati #2, 28"x10"x18"
Cincinnati #2M, 28"x10"x18"
B & S #3, 34"x10"x21"
Cincinnati #3S, 34"x12"x20"
Some w/index heads & equipment

SHAPERS

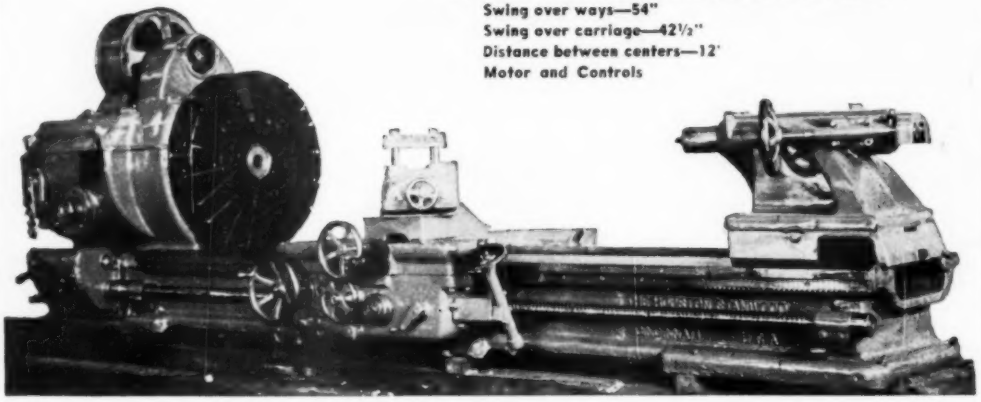
Shaper—Columbia 32" B.G. Crank, motorized. Power downfeed to head.
Shaper—Logan 7" Horizontal. NEW
Shaper—Machinery Sales 16", motorized
Shaper—Gould & Eberhardt 16", motorized
Shaper—Smith & Mills 16", motorized
Shaper—Smith & Mills 16" Universal
Shaper—Gould & Eberhardt 18" B.G. Crank
NEW—Gemco 20" Universal Shaper. M. Dr.
Shaper—American 24" crank, motorized
Planer—Shaper—Niles-B. Pond 20x20x24

DRILLING MACHINES

Cinci-Bickford 6' Arm, 15" col. Radial
Cinci-Bickford 5' Arm, 13" col. Radial
Fosdick 5" Arm 14" col. Radial
American 4' Triple Purpose Radial, M. Dr.
Cinci-Bickford 3' Arm, 9" Col. Radial. Motor driven. W/table. 12 Speed gearbox.
Walker-Turner 30" Ball-Bearing Radial Drill. ½ h.p. 3/60/220/440 volts motor drive. Tilting Head and Swivel Arm. Universal Machine. Complete with steel bench.
Minster #2D Single Spindle Upright Heavy Duty 2½" cap. Compound Table. Motorized.
Buffalo Forge #2MS Drill. Late Type.
Leland-Gifford #2MS, 2-Spindle Upright.
NEW Buffalo Forge #15, #18 Single Spdles.

Heavy Duty Engine Lathe

54" x 18' HOUSTON STANWOOD & GAMBLE
Swing over ways—54"
Swing over carriage—42½"
Distance between centers—12'
Motor and Controls



2000 TON HPM. FASTRAVERSE HOBBING PRESS
7" DETRICK & HARVEY PLANER TYPE BORING MILL
27" x 38' LEHMANN HOLLOW SPINDLE LATHE, 9" HOLE IN SPINDLE

EMERMAN MACHINERY CORP.

875 W. 120TH ST.
CHICAGO 43, ILL.

ROLLS—BENDING—Hilles & Jones 30'x¾", Pyramid Top Roll 30", Bottom Rolls 20", Motors 75 & 45 HP, 3/60/220-440 controls, Wt. 120 Tns

ROLLS—BENDING—Cleveland #2A, 10'x½", Pyramid Type, Drop End, 29 H.P.

(2) **AUTOMATICS**—National Acme 1⅝" cap. 4 spindles, bar feeds, tooling, motors. (Age 1911) Model G.A. BARGAIN

IRONWORKER—Combination Punch & Shear, Ockling, Angles 6"x6"x1½", Rounds 1⅝", Sqs. 1⅜", Motor, Machine Ser. #516F

PLANER—Niles Bement Pond, Working Bed 48"x48"x26' with 4 Heads, 15 HP, DC, 230 volt, variable speeds

SHEAR—Power Sq., Niagara 15'x10G, with 15" gap, front & back gauges, 7½ HP motor, Wt. 12,000 lbs.

SHEAR—Single End, Link Belt, 30" gap, 24" blade, 7½ HP motor, Wt. 7 Ton

HAMMER—Drop Forge, Chambersburg 35,000 lb. cap., like new, air or steam operated, Height 24', Weight 325 Ton

UPSETTER—Horiz. Forging, Ajax #2½", Mtr. 15 HP, Wt. 15 Ton, approx.

SHEAR—NEW, Barth 52"x14 G. Motor, front & back gauges, no gap. Sells for $1200.00. Our price $1000.00

PLATE PLANER—Hilles & Jones, 30'x2" cap. Pneumatic Hold-downs, one head, 5" diameter lead screw, 30 HP, 3/60/220 motor worm drive

WIRE STRANDERS—(1943) Two—Robinson 6"x7 spool, reel, motor 7½ HP

LATHE—ENGINE—Bridgeford, Geared Head, G.C., 32"x21' centers, Motor 35 HP, serial #32,870

LATHE—TOOL ROOM—South Bend, Latest type, 14"x8' overall, actual 16"x30" centers, taper attach, draw bar & collets, motor in base, machine ser. #134077

MILLER—Plain Horiz. Model #4K, K.&T. like new, latest dial type, double overarm, Table 10"x80", power rapid traverse all directions, motor in base, wt. 14,000 lbs.

PRESS-LAKE ERIE—750 Ton, Hydraulic Double Action, Bed 81½"x140", will draw & lift out 22¾", complete, pump & motors 40 HP & 10 HP, controls (1942) Wt. 75 Ton Single or double action

POWER PRESSES

PRESSES	TONS	STROKE	BED—FB, LR	TYPE
(2) Bliss #58	22	5"	12½"x 13½"	C Frame (1943)
(4) Ferracute C22	22	5½"	13½"x 14"	Duplex 2 Presses on 1 stand (1943) Hopper Feed
(7) Diamond #38	31	3"	13" x 22"	O.B.I. Motor (New)
(1) Torrington	30	2" & 1"	23" x 16"	Sub Arch, Dbl Action, Cam
(1) Toledo #54	60	3"	18" x 18"	SS with side shear
(2) Bliss #305	100	12"	24" x 24"	SS, b.e. (1943)
(2) Bliss #6	125	2" & 5"	24" x 32"	SS, dble or single action b.g. (1942)
(1) Clearing F1290-42	200	30"	38" x 44"	SS, Single Action, (1942) b.g.
(1) Baldwin-Southwark	250	40"	60" x144"	Hydr. SS, 4-Post
(1) Bliss #78½ (310)	450	18"	52" x 36"	SS, Single Action
(1) Baldwin-Southwark	500	42"	52" x 52"	Hydraulic, 4-Column Hydraulic, dbl action
(1) Lake Erie	750	up to 46"	81½"x140"	Draw 22¾" (1942)
(1) Lake Erie	800	30"	78" x 72"	Hydraulic, 4-Post, SA, (1944)
(1) Lake Erie	1320	up to 36"	48" x 88"	Hydraulic (1942)
(1) Woods	1500	18"	68" x 16'	Hydraulic, 4-Post (Rebuilt 1942)

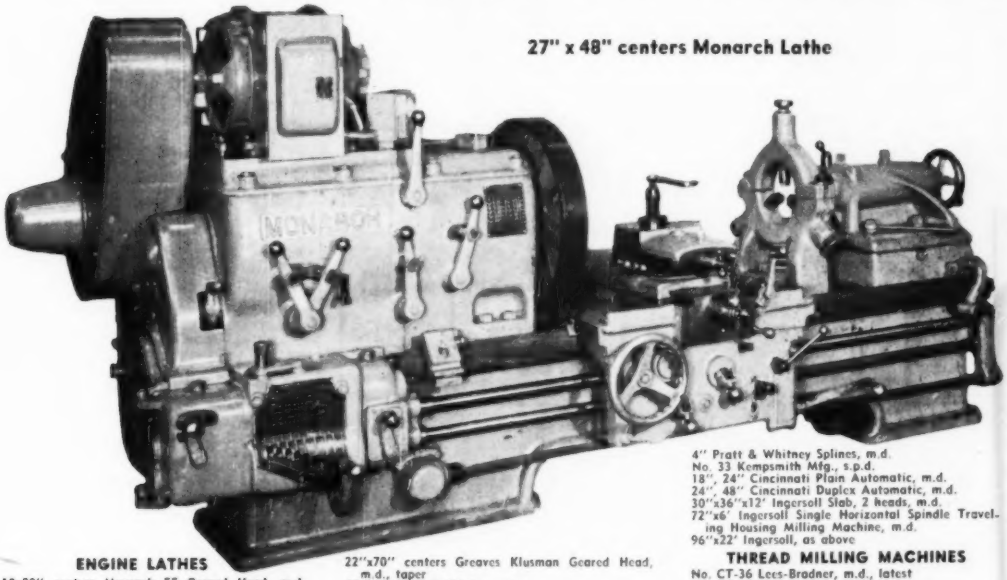
MONA MEMBER

KINGS COUNTY MACHINERY EXCHANGE

408 Atlantic Ave., Brooklyn 17, N. Y. **Phones: TRiangle 5-5237, 5-5212, 5-5213**

Eastern For • DEPENDABILITY • SERVICE • QUALITY REBUILDING

• LATE MODEL MACHINES • GUARANTEED EQUIPMENT



27" x 48" centers Monarch Lathe

ENGINE LATHES

10x20" centers Monarch EE Geared Head, m.d., latest
10x24" Logan, cone, motorized
13x30" centers Pratt & Whitney Model B, m.d., taper
13x48" centers Pratt & Whitney Model B, m.d.
14x30" centers Lodge & Shipley Selec. Head, m.d., latest
14x54" centers Bradford Geared Head, m.d., taper
14"x6' bed Hendey Geared Head, m.d., taper
14"x6' Pratt & Whitney, cone
14"x6' LeBlond, cone
14"x6' Sidney Geared Head, m.d.
14"x6' Springfield Geared Head, m.d., taper
14"x8' Prentice, m.d., taper
14"x8' Pratt & Whitney, cone
15"x6' LeBlond Geared Head, m.d.
16"x14' American Geared Head, m.d.
16"x36" Pratt & Whitney Geared Head, m.d.
16"x6' Bradford, cone
16"x6' Hendey Geared Head, m.d.
16"x6' Hendey Yoke Head, taper
16"x6' Lodge & Shipley Selec. Head, m.d.
16"x6' bed Monarch Geared Head, m.d.
16"x10' Hendey Yoke Head, taper
17"x6' LeBlond Geared Head, m.d.
18"x52" centers American Geared Head, m.d., taper
18"x5' LeBlond Geared Head, m.d.
18"x6' bed Lodge & Shipley, cone, motorized
18"x7' Hendey Geared Head, m.d., taper
18"x8' American Geared Head, m.d.
18"x8' Champion, cone
18"x8' Hendey Geared Head, m.d.
18"x8' Lodge & Shipley Selec. Head, m.d.
18"x8' Lodge & Shipley, cone
18"x8' Whitcomb-Blaisdell Geared Head
18"x10' Cincinnati, cone
18"x10' Lodge & Shipley Selec. Head, m.d.
19"x8' bed LeBlond Geared Head, m.d., taper
19"x10' LeBlond Geared Head, m.d.
20"x8' American Geared Head, m.d., taper
20"x8' Cisco, cone
20"x10' Sidney Geared Head, m.d.
20"x11' Lehmann Geared Head, m.d., taper
21"x12' Bradford, cone
21"x18' LeBlond, cone
22"x70" centers Greaves Klusman Geared Head, m.d., taper
22"x8' Lodge & Shipley, cone
23"x12' LeBlond Geared Head, m.d., taper
24"x10' Hendey Geared Head, m.d.
24"x10' American, cone
24"x10' Greaves-Klusman Geared Head, m.d., taper
24"x10' Lodge & Shipley, cone
24"x12' Bridgeford Geared Head, m.d. taper
24"x12' LeBlond, cone
24"x12' Monarch Geared Head, m.d., taper
24"x40' bed American Geared Head, m.d.
25"x10' LeBlond, cone
26"x8' Bridgeford Geared Head, m.d.
26"x12' Bridgeford Geared Head, m.d., taper
27"x48" centers Monarch Geared Head, m.d.
20"x12'6" Niles-Bement-Pond, m.d., taper
30"x13'6" Niles-Bement-Pond, m.d.
30" raised to swing 36"x20' American Geared Head, m.d., taper, Timken
32"x12' Lehmann Hydratrol Geared Head, m.d., taper, latest
36"x32' centers Putnam Geared Head, m.d.
36"x36'6" Niles Heavy Duty, m.d., latest, 2 carriages
50"x204" centers LeBlond Geared Head, m.d., taper, latest

MANUFACTURING TYPE MILLING MACHINES

No. 00 Sundstrand Hydraulic Rigidmill, m.d., latest
No. 0-8 Cincinnati Model EA, m.d., latest
No. 12 Brown & Sharpe, m.d.
No. 1-12 Cincinnati, m.d., latest
No. 1-18 Cincinnati, m.d., latest
No. 2 Sundstrand Electromill, m.d., latest
No. 2-18 Cincinnati, m.d., latest
No. 2-18 Cincinnati, m.d., with rise & fall, latest
No. 2-24 Cincinnati, m.d., latest
No. 4-48 Cincinnati Plain Hydromatic, m.d., latest
No. 4-48 Cincinnati Duplex Hydromatic, m.d., latest
No. 34-36 Cincinnati Duplex Hydromatic, with tracer control, latest
No. 34-36 Cincinnati Plain Hydromatic, m.d., with tracer control, latest
No. 56-72 Cinni. Duplex Hydromatic, m.d., latest
No. 56-90 Cinni. Duplex Hydromatic, m.d., latest
Type P Ohio Mfg., m.d.
Sundstrand Rigidmill, m.d.
4" Pratt & Whitney Splines, m.d.
No. 33 Kempsmith Mfg., s.p.d.
18", 24" Cincinnati Plain Automatic, m.d.
24", 48" Cincinnati Duplex Automatic, m.d.
30"x36"x12' Ingersoll Slab, 2 heads, m.d.
72"x6' Ingersoll Single Horizontal Spindle Traveling Housing Milling Machine, m.d.
96"x22' Ingersoll, as above

THREAD MILLING MACHINES

No. CT-36 Lees-Bradner, m.d., latest
No. CT-54 Lees-Bradner, m.d., latest
Hall Planetary, m.d.
41"x12", 6x14", 6x48", 6x80" Pratt & Whitney
1024" Hanson Whitney, m.d., latest

TURRET LATHES AND SCREW MACHINES

No. 1H6 Libby, m.d., chucking, latest
No. 1 Cincinnati Acme Semi-Universal, m.d., chucking, Timken
No. 1L Gisholt Universal, m.d., chucking, Timken
No. 1A, 2A, 3A Warner & Swasey Universal, bar and chucking types
No. 2A, 3A Warner & Swasey Universal, chucking, Timken
No. 1A Warner & Swasey Universal, chucking, preselector head, latest
No. 2B Foster Universal, m.d., chucking
No. 2F Gisholt Fastermatic, m.d., latest type
No. 2G Morey, bar, m.d., latest
No. 2L Gisholt, m.d., chucking, standard and long bed types, Timken
No. 3 Cinni-Acme Full Universal, m.d., chucking
No. 3 Foster Geared Head, m.d., bar
No. 3B Foster Universal, m.d., bar
No. 3L Gisholt, m.d., chucking, Timken
No. 3L Gisholt, with cross sliding turret
No. 3 Warner & Swasey Universal, m.d., bar, latest
No. 3 & 3A Warner & Swasey Universal, m.d., chucking, latest
No. 4R Cincinnati Acme, m.d., bar
No. 4 Gisholt Universal, m.d., chucking, Timken
No. 4 Warner & Swasey, Plain, cone, bar and chucking types
No. 4 Warner & Swasey Universal, bar, m.d.
No. 4 Warner & Swasey Universal, bar, m.d., preselector head, latest
No. 4 Warner & Swasey Universal, chucking, as above
No. 4A Warner & Swasey Universal, m.d., chucking, latest type
No. 4A Warner & Swasey Universal, m.d., chucking, Timken
No. 4FU Foster Fastermatic, m.d., latest

We carry an average stock of 2,000 machines in our 11 acre plant at Cincinnati. Let us quote on your requirements.

THE EASTERN MACHINERY COMPANY
1004 Tennessee Avenue, Cincinnati 29, Ohio
MElrose 1241
CABLE ADDRESS EMCO

Our 50th Year of Service

Save at Botwinik Bros.

DRILLS

Baush M.D. Multi 12 Spd. No. 3 M.T.
Avey & Allen 3, 4, 5 & 6 Spindle.
Cinn. Bickford M.D. 6' Radial.
Niles Bement & Pond 6' Radial.
Fox M.D. Type 138C Multi-Spld. Late.
American 6' 15" Gear Drive Radial.
American 3' 9" M.D. Maxi-Speed Radial.

GRINDERS

Norton 6" x 10" x 36" Surface.
Norton 15" x 17" x 72" Surface.
B & S Nos. 1, 2, 3, 4, Univ.
Brown & Sharpe Nos. 5 & 11 Plain.
Bryant Nos. 3B, 6, & 12 Internal.
Excello No. 31 Thread.
Landis No. 3 M.D. inside radius.
Cincinnati Nos. 2 & 3 Centerless.
Cincinnati No. 3 Centerless Lapper.
Cin. No. 2 M.D. Univ. Cutter & Tool.
Landis 4" x 18" Type H, Pl. M.D. Hyd.
Blanchard No 16—26" and 16A.
Blanchard No. 16-30 Vert. Late.
Heald No. 25A—16" Rotary Surface.
Heald Nos. 70A and 72A Internal.
Abrasive Nos. 33, 3 & 34 Sur.
Pratt & Whitney 14" B.B. Vert. M.D.
Norton Type "C" 6" x 18" M.D. Hyd. Cyl.
Norton 10" x 24" M.D. Plain Cyl.

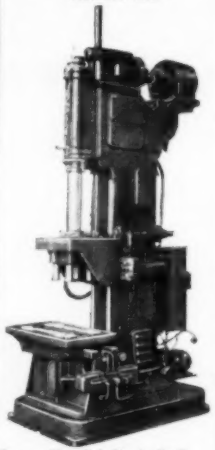
LATHES

Johnson 36" x 36' B.G. L.C.G. Eng.
Monarch 12" x 30" C.K. (Swings 18").
Hendey 12" x 5' Y.H. Fact M.D.
Hendey Plain 12", 14", 16", 18" Yoke Head.
American 30" x 15' G.H. M.D. Q.C.G. Eng.
American 30"x25' G.H. Q.C.G. M.D. Eng.
Hendey 24"x8' M.D. Q.C.G. Eng.
Hendey 12"x5' M.D. Geared Head.
J & L (Fay) Auto. 12" x 96" x 11" G.H. M.D.

MILLERS

K & T 2H D.O. M.D. Plain Late.
K & T 2H Vert. Sliding Head, M.D. Late.
Milwaukee No. 11½B Univ. M.D.
Cincinnati No. 2 Univ.
Cincinnati 0-8 M.D. Prod. Late.
Milwaukee No. 3B Univ. D.O.
Brown & Sharpe No. 3A Univ.
Cincinnati 2 & 3 Vert.
Van Norman 3SP Plain.
Brown & Sharpe No. 3 Vert.
Brown & Sharpe No. 2B and 3B Plain.
Van Norman 22L—Ram Type Duplex Late.
Van Norman Nos. 0, 6, 10 & 11.
P. & W. 4½" x 36" M.D. Thread Late.
Pratt & Whitney 8", 10" & 12" Auto.
Cincinnati 18" & 24" Production.
Pratt & Whitney 6" x 80" M.D. Thread.
B & S No. 12 M.D. Plain Prod. Late.
Kempsmith No. 2G Plain. Late.
U.S. MM-5 M.D. Rt. Hand Multi.
Gorton 9J Vert. Late.
Gorton B1½D M.D. Vert. Miller.
Gorton 8D M.D. Vert. Miller.
Sundstrand No. 3 M.D. Rigidmil
Brown & Sharpe No. 21 Plain Auto.
Kempsmith No. 4 Plain Maximiller. Late.

Actual Photo



Barnes No. H-2 Single Spdl. Hydram Prod. Drill, with 4 Spdl. Multi-Spdl. Head

Cinn. 3-24 M.D. Pl. Hydromatic.
Cincinnati 1-M Univ. Miller.

SHAPERS

Cincinnati 24" M.D. Crank. Late.
Hendey 32" M.D. Crank. Late.
Gould & Eberhardt 16" & 20" M.D. Crank.
Hansen Whitney Univ. Vert. Tool & Die.

PRESSES

Bliss No. 31S O.B. Geared Power Verson
Verson No. 10842—500 Ton M.D. Twin-Geared S.S.
Bliss No. 304 M.D. S.S. Single Crank.
Bliss 33¼A D.A. Toggle.
Waterbury Farrel 400 Ton Knuckle Joint.
Bliss No. 52 2½ Stroke B.G. M.D. S.S.
Stoll No. 4 Double Crank.
V. & O. No. 61 M.D., S.S. 11¼" St.
Diamond No. 30, 30 Ton M.D. O.B.I. 3" St.
Walsh No. 4 3½" St., M.D. O.B.I.
Pexto No. 16 O.B.I. 2½" St., 48 Ton

SCREW MACHINES

Brown & Sharpe Nos. 00, 0, 2, 4 & 6 Auto.
Brown & Sharpe Nos. 1 & 2 Hand.
W&S Nos. 1, 2, 2A, 3A Univ.
Foster No. 7 and No. 7B.
Gridley 7/8", 1¼", 1¾" and 2⅝" Model "G."
Cleveland 2½" Model K.
J & L No. 5 M.D. Turret. Late.
Acme 6W M.D. Turret. Late.
Cone 1¼", 3½", 3½", & 4¾"—4 Spindle.
Cleveland 6¾", 7¾" Model A.
Brown & Sharpe ±00G, 0G, & 2G Auto.
Brown & Sharpe 2F Turret.

New, Used and Engineered Rebuilt Machine Tools

50th ANNIVERSARY — MONA MEMBER

Botwinik Bros.

INCORPORATED

EXPORT DEPARTMENT: 44 G. WHITEHALL ST., NEW YORK 4, N.Y., U.S.A.

373 WELTON STREET, NEW HAVEN 9, CONNECTICUT

AUTOMATICS

No. 16 New Britain 6 spdl. chucking
No. 454 New Britain chucking
14"x19" Fay Chucking
8" Bullard 6 spindle Mult-Au-Matic
½", No. 0G Brown & Sharpe
⅝" Acme Gridley Model R6
⅞" & 1¼" Cone 4 spindle
1" Economy shaver, hopper feed
1 1/16" Cleveland 4 spindle
1⅜" New Britain, Model 61
1⅞" Conomatic 8 spindle
2"x18" Cleveland Model B
2⅜" Acme Gridley Model RA6

BORING MILLS

100" Niles Bement Pond vertical
52" King vertical
24", 30" & 42" Bullard vertical
2½" bar, No. 25 Giddings & Lewis
3" bar, No. 3A Universal
3" bar, No. 31 Lucas
3½" bar, No. 5A Defiance
3½" bar, No. 32 Lucas
5" bar Jones, planer table type
Nos. 112B & 2112 Excello precision
Nos. 42, 47A & 48A Heald Borematic

GRINDERS

Nos. 1 & 2 Brown & Sharpe univ.
10"x24" Landis hydr. universal
No. 2 Norton univ. tool & cutter
26", No. 226 Gardner disc
53", No. 372 Besly horiz. disc
No. 11S Gardner opposed disc
No. 230 Hanchett opposed disc
No. 2 Cincinnati centerless
No. 510 Oliver drill grinder
Nos. 6G & 10G Sellers drill grinders
Norton, 6"x18", 10"x36" & 23"x36"
Landis 6"x18", 14"x36"
No. 2B Brown & Sharpe surface
12"x48" Thompson surface
14"x60" Mattison surface
No. 34 Abrasive surface
18" & 24", No. 25A Heald surface
12" & 16", No. 22 Heald surface
Nos. 72A3, 72A5, 74 Heald internal
No. 72A3 Heald Sizematic
No. 72A3 Heald Sizematic centerless
Nos. 16A16, 16-28, 16-38 & 24-36 Bryant

LATHES

36"x16' Bridgeford
25"x48" centers Leblond
20"x8' Lodge & Shipley
18"x8' Rockford
16"x8' Porter McLeod
16"x30" centers Monarch
16"x5' Sebastian
14"x6' Lodge & Shipley

LATHES, TURRET

Nos. 2, 3, 4, 5, 1A & 3A Warner & Swasey
Nos. 5 & 7 Bardons & Oliver
Nos. 3, 4 & 3AL Gisholt
24" & 42" Bullard vertical
No. 62 Denver
No. 4 Midland
Nos. 2G & 3 Morey
3"x36" & 4"x34" Jones & Lamson

SHAPERS & PLANERS

6" Pratt & Whitney vert. shaper
16" Bement Miles slotter
16", 20", 24" & 28" G&E shapers
20" & 24" Gemco univ. shapers
24" Columbia univ. shaper
30"x24"x6' Liberty openside planer

SHEET METAL TOOLS

8'x1/4" Cincinnati press brake
8' x 10 ga. Dreis & Krump leaf brake
10' x 14 ga. Dreis & Krump leaf brake
8' x 10 ga. Beloit bending roll
No. 2021½ V. & O. thread roller
72" x 14 ga. Wysong & Miles shear
60", 14 ga. Pettingell rotary shear
Nos. P1, P2, P3, P4, P5 Ferracute presses
Nos. 18 & 19 Bliss OBI presses
No. 6 American Can OBI press

MILES MACHINERY CO.
SAGINAW, MICH.

LATE TYPE MACHINES

5' - 13" Cincinnati - Bickford Super - Service Radial
24" Cincinnati-Bickford Super-Service Upright Drill
±3H Milwaukee Plain Miller
±1-1B Cincinnati Production Millers
±3MS Cincinnati Plain Miller
±174 Heald Internal Grinder with gap to swing 54"
±16-Y-2B Bryant Internal Grinder
10"x48" Norton "C" Grinder, oscillating wheelhead
±2 Cincinnati Filmatic Centerless Grinder

HAZARD BROWNELL
350 Waterman St., Providence 6, R. I.
Dexter 8880

National Bent Shank Nut Tappers Battery of ⅝" to 1" Machines.

Waterbury-Farrel Fdry. ⅝" and 1" D.S. S.D. Cold Headers, also Thread Rollers.

Fisher 5" Bar, Floor Type Boring Mill. New in 1942.

Niles, Bement, Pond 60"x60"x24' table 4-Head Planer, Rev. D.C. M.D.

Bliss Presses in all sizes up to 1,000 ton capacity.

Wire Working Machinery.

National Machinery Exchange
128-138 Mott St., New York 13, N. Y.

LATE TYPE MACHINERY AT OLD TIME PRICES

AUTOMATICS

Brown & Sharpe #00G, H.S. (8) #4, #6
Consmatic 8 sp. 1¾" cap.

BORING MILLS

Giddings & Lewis #0, #25T
Lucas #31 horiz.
Universal 3" horiz.
Bullard 24", 42" New Era V.T.L.

DRILLS AND RADIALS

Barnes #262, Buffalo 18", 1" capacity
Cinci-Bickford Super Service, 21", 24".
Delta Bench & Floor Models single & 4 spindle
Royersford Excelsior 21" Back Geared, P.F.
Sibley 24—28" Latest
Natco Model E-5 Multi-Spindle, 14 spindles
American Hole Wizard 3'-9" col., 4'-11" col.
Canedy-Otto 3'-9" col.
Carlton 8'-19" col.

ENGRAVERS

Gorton #3U, 3Z 2 dimensional; #3L, 3 dimensional
Gorton Cutter Grinders

GEAR EQUIPMENT

Fellows #72, 725 High Speed
Mikron Gear Hobber
National Broach Checker; Michigan Gleason

GRINDERS—Miscellaneous

Brown & Sharpe #5 cyl., 3"x18"
Brown & Sharpe #2, #3 Univ., #13 Univ. & Tool
Cincinnati #2 Centerless Filmatic, 12"x36 Univ.
Covel #91A Univ. Tool & Cutter
Excello #44 Carbide, Hammond #4
Gardner #226, 30 disc, Heald #1 Tool
K.O. Lee Tool & Cutter
Landis #4H Cyl. 4x12", Landis #6 Thread & Centerless
Norton #2 Tool & Cutter
Norton Cyl. 6x18" Type C, 6x30" Type C
Oliver #510 Drill Pointer, Sellers #4G
Pratt & Whitney Radius #R6
Black Diamond #1 Drill
Porter Cable Belt WG8, G8

GRINDERS—Surface

Abrasive #1½" Wet Hand Feed, #34 Vertical
Atlantic 6x18" Power Feed
Brown & Sharpe #2, #5 Hyd. 8x24" Cap.
G. & L. #18, 6x18" Hand Feed, #25, #35 Hyd.
Hanchett #300, 13x48"
Mattison 14x16x48" Hyd.
Norton 6x18" Hyd.
Reid #2A P.F., #2C Pope Spdl Hand
Pratt & Whitney 12x36" Vert.
Thompson Hyd. 6x10x18", 8x12x18

LATHES

Hardinge Precision 9", cabinet
Hendey G.H. 12x30", 16x30
LeBlond Regal 10"x3½", 15x30", 19x42", 21x60"
LeBlond Heavy Duty 16x33"
Lodge & Shipley 16x78" T.A.
Monarch 10"x20" EE, 16x78" T.A., 12x30"
Rivett Precision, Logan 10"x30"
Sebastian 12"x4' G.H., Sheldon 11x24", 1" collet
South Bend 9"x3', 9"x3½', 13x36", 16"x7'
South Bend 10" Toolroom 1" collet capacity, T.A.

LATHES—Turret

Acme #6W Bar & Chuck, 6W Fox Lathe
Gardner & Oliver #3, #5, Foster #3B
Brown & Sharpe #1, 2F Hand Screw Mach.
Gisholt #4, 5 Bar & Chuck
Hardinge ESM Second Operation
Jones & Lamson #8A Univ. Saddle Type
Oster #601 Rapiduction, Morey #3, 1½" cap.
Warner & Swasey #3 Universal, #4 Pre-Selector

MILLS—Plain & Universal

Brown & Sharpe #2 Pl., #2A Univ.
Burke #4 Plain & Univ., Vert. Hds.
Cincinnati #3 Plain, 2MH Univ.
Milwaukee #2HL, 2H Plain
Milwaukee #2HL, 2H, 3H Univ.
Van Norman #12, 36

MILLS—Vertical

Bridgeport vertical with Slotting Attach.
Brown & Sharpe #2
Cincinnati #4 Dial Type
Kearney & Trecker #5H
Gorton #8D, 9J Plain
Gorton #8½D, 9J Duplicator Fully Equipped
Fosdick Jig Borer #42 Like New
Sip Jig Borer #MP-5
Morey #12M Profiler 2 sp.—Pratt & Whitney 12B

MILLS—Production

Brown & Sharpe #000, 12, 21
Cincinnati #1-12, 2-18 Mig.
Kent Owens #1V, 2-20
Nichols Hand, Vert. Hd., U.S. MM 1
Sundstrand #00, U. S. Duplex

PRESSES

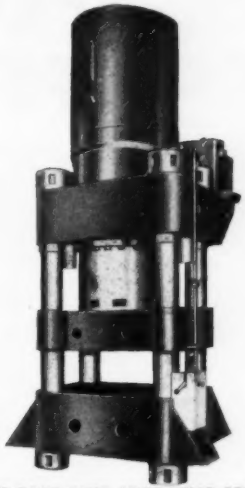
Bliss #8 Dbl. Crank, Bed 42x100"
Bliss #675 Hi-Production
Bliss #20, 21 O.B.I., #4½ Double Action Cam
Bliss #58 O.B. Gap Frame #62, 92A, 162 SS
General Flexible Elec. Screw
Henry & Wright 25, 60, 75 Ton Dieing
Thomas 50 Ton O.B.I., Diamond #31 O.B.I.
Toledo 400 Ton Knuckle Joint #663
V. & O. #25S O.B.I., #102 Reducing
Z & H 30 Ton O.B.I.

MISCELLANEOUS

BAND SAW: Tanewitz #36M
BENDING ROLL: Buffalo #0, ½, Excelsior #14
EYELETTER: Peerless #226
FILER: Oliver, HEAVY DUTY
HACKSAW: Marvel #6A Automatic, #6, #4B
HARDNESS TESTER: Rockwell 4JR, Clark
HAMMER: Niles Bement Pond 2500 lbs. steam
HAMMERS: Rochester Rivetting, Hi Speed
HONER: Micromatic #H-1 Hydrohoner
INJECTION MOLDER: Reed-Prentice #100S, 6 ounce

NEW IN STOCK

Air Hydraulic Presses—Arbor Presses #6C Famco, ⅓ off list price—Band Saws Kalamazoo 8x16", 8x24"—Drill Presses all sizes—Grinder Surface, Abrasive #1½—Hydraulic Press Northern 20 Ton—Injection Molders, 1 ounce—Power Presses, Famco 4½, 7½ Ton, Rousselle O.B.I. & Horn 5, 10, 15, 25 Ton, Pressrite OBI, 5, 10, 12, 18, 30 ton cap.—Shaper, 7" Ammco, 8" Shaprite, Sheldon 12"—Shears, Foot 22" to 8', 16 & 18 ga., Shears, Power, 3'x18 gauge to 10'x10 ga.—Welders, Arc Seam, Spot all sizes—Vert. Milling Attach. Haloo. HS 5 & 10 Speed—Motors, Grinders, Buffers, all sizes.



SELF-CONTAINED HYDRAULIC PRESS

HYDRAULIC EQUIPMENT

Cap.	Manufacturer	Platen	Stroke	Opening
550 Ton	Lake Erie	35x36"	36"	68"
600	Baid. S'thw'k	70x38"	22"	30"
500 D.A.	H.P.M. (160 Cushion)	36x36"	24"	30"
1000	French Oil	53x42"	20"	50"
300	Brand New Watson Stillman Hobbing Press			
375 D.A.	Elmes (60 Cushion)	84x44"	12"	42"
350	Verson	40x40	36"	72"
50	Dennison	22x20	18	23
150	Southwark	34x30	30 2' to 4'	

UP MOVING RAM PRESSES

50 & 100 Ton Stokes Molding Presses & Pumps
300 Ton Dunning & Boschert Molding Press
500, 800 Ton Waterbury-Farrel 3 & 4 Rod Presses, 6 & 6½" strokes
300 Ton Watson Stillman Press, 24x20" Platens
400 & 500 Ton Shaft Straighteners—Self Contained

All Hydraulic Equipment is completely engineered and checked by a competent staff, thus assuring reliability. Send us your Hydraulic problems.

IRONWORKER: Buffalo 25U x 20
KEYSEATER: Davis #4, Mitts & Merrill, Baker
PLASTIC GRINDER: Bell & Jewel, Cumberland
PRESS BRAKE: #253, #335 Chicago, 8L10
ROUTER: Onsrud #W240, #55
SHAPER: 8" Shaprite, Ammco, Atlas
SHEAR: Pexto, 6'x14 Ga. Power
SHEAR THROATLESS: #138 Lenox
SPEED LATHES: Cincinnati, Schauer
TAPPERS: Bakewell #1, Haskins #2C, 3C
THREAD ROLLER: Waterbury-Farrel #30 with Dies
WELDERS: Seam; Thompson
WELDERS SPOT: Taylor-Winfield 50 KVA, Sciaky
WRAPPING ROLL: Buffalo #½

THIS IS ONLY A PARTIAL LISTING. WHY NOT SEND US YOUR INQUIRIES

WRITE FOR OUR FREE ILLUSTRATED CATALOG

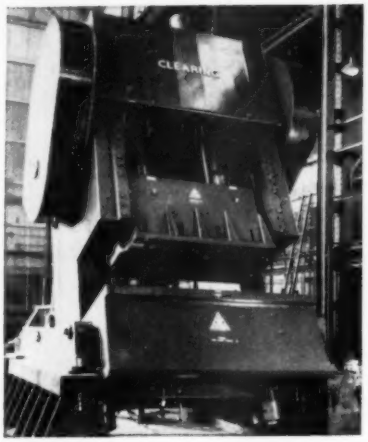
AARON MACHINERY CO., Inc.

45 Crosby Street
WO rth 4-8233

New York 12, N. Y.
Cable: AARMACH, N. Y.

MONA MEMBER

SPECIAL OFFERING



★ Three *new* 500-ton G-1084 Clearing Single Action D.C., Gap Frame, tie-rod construction, Inclinable Presses for sale, complete with electrical equipment.

Two of these presses have 18″ stroke; crankshafts 10″ and 15″. Distance between frames—86″. Adjustment of slide—12″. Area of slide F to B x R to L is 48″ x 84″. Area of bed F to B x R to L—48″ x 120″. Bed opening—33″ x 69″; shut height 40″. Strokes per minute—16. Weight approximately 100,000 pounds. (One of these is still at manufacturer's plant waiting shipment.)

The third press is same as above, except with 26″ stroke. Weight approximately 120,000 pounds.

Offered as is, where is, F.O.B. cars, subject to prior sale or withdrawal.

★ **Arrangements for inspection can be made by contacting Mr. J. G. Schramm, Purchasing Engineering Department, Equipment Sales Division, Ford Motor Company, 3000 Schaefer Road, phone ORegon 4600, extension 7686.**

FORD MOTOR COMPANY
DEARBORN, MICHIGAN

NEW SURPLUS

SURFACE PLATES

12"x18", Hand Scraped, with Handles, Cover. Weight 70 lbs. PRICE: $29.50 each.

SURFACE PLATES

10"x14". Ground on All Sides. One Side Surface Plate, Reverse Side Lapping Plate. Weight 50 Lbs. PRICE: $15.00 each.

12" COMBINATION SQUARES

With Bevel Protractors Complete, Union. PRICE: $5.50 each.

VICTOR MACHINERY EXCHANGE, INC.
251 CENTRE STREET
NEW YORK 13, N. Y.
CANAL 6-5575

UNUSUAL VALUES

Milling Machines—No. 1, Universal, No. 1 American (new) plain, No. 1 Vertical.

Drills—Large selection, single and multiple spindles also bench types, many of them new.

Gear Cutters—Brown & Sharpe No. 3—26″ Gould & Eberhardt 42″.

Grinders—Cylindrical B & S No. 11, Planer type 16″x36″, Surface 12″x36″, also new (small) Universal bench and floor type. All with coolant, motorized.

Lathes—14″x6′, 8′, 10′—16″x6′, 8′, 10′—18″x8′, 8′, 10′—26″x16′—all cone drive, several motorized also (new) 18″x8′ and 10′ geared head, motorized.
Large stock 19″ and 18″ bench and floor type.

Planers—Single head 24″x6′, 24″x8′, 26″x8′.

Shapers—16″, 20″, 24″, B.G. crank.

Turret Lathes—J & L 2″x24″—3″x36″ also Acme, W & S Turret (vertical) boring and facing mills, 5 hole turrets, 30″, 40″.

SPECIAL—New totally enclosed dust proof, fan cooled, ball bearing saw arbor motors, plain shafts to size or threaded, and with collars, measures only 3¼″ from center of shaft to flatted top (1 h.p. to 15 h.p.) 2 or 3 phase, 3600 r.p.m.

WOOD WORKING MACHINERY—A very large stock of new and re-built, practically all motorized. New Motorized overhead cut-off and miter saw for wood, plastics, steel, aluminum and other metals. The above list is only a fraction of our stock which changes almost daily, therefore, tell us definitely what you want since we are adding considerable number of machines to our stock which are too many to list. What we have today may be sold tomorrow, so a list is really not dependable.

Drill—Foote-Burt No. 25 24″ Hi Duty 3″ capacity in steel. Motor attached.

PATTERN MAKING MACHINERY—42″x16′ bed wood lathe, compound rest, rack and pinion feed to carriage; 16″ heavy duty jointer, extra long bed, front table tilts for giving draft to pattern work; tilting table also tilting arbor rip and cut-off saws; band saws; jointer; floor and bench type trimmers; and also many other machines for pattern work.

THE OSBORNE & SEXTON MACHINERY CO.
P. O. Box 88, Columbus 16, Ohio

GUARANTEED MACHINE TOOLS

Cincinnati 1-18 Prod. Mill Backlash Elim. '43
Sundstrand ⇵1 Horizontal Rigidmill '42
B. & O. ⇵5 Bar Feed '45
Gisholt ⇵3 Bar Feed Pre-Selector Head '43
New Britain Model 61 1⅝" 6 Spindle
Auto. Screw Machine '42
Greenlee 1⅝" 6 Spindle Auto. Screw Machine '41
Pratt & Whitney 12"x30" Tool Room Lathe TA '44
Springfield 14"x24" Mfg. Lathe '40
Allen 2KH 6 Spindle Drill Press '45
Foot-Burt 2 Spindle Drill Press '45
Canedy-Otto 3 & 4 Spindle Drill Presses
Bliss ⇵305 96 ton Press '42
Cincinnati ⇵2 Centerless Grinder '41
Jones & Lamson Model TG-615 Thread Grinder '42

MAC DELL CORPORATION
68 W. Washington St.
Chicago 2, Ill.
PHONE: ANDOVER 3-1227

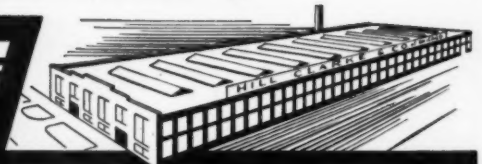
MONA MEMBER

FOR SALE

Industrial Deepfreeze "Cascade"—3 stage compressor with 2—½ HP and 1—⅓ HP motors all single phase, 110 volts. Removes 1,000 BTU's per hour at —120°. 24" x 30" deep chamber. Santocel insulation. For shrinking, testing and treating of metals. Excellent condition. Complete $1,500.00.

THE VAN KEUREN CO.
175 Waltham St., Watertown, Boston, Mass.

HILL-CLARKE MACHINERY COMPANY



ESTABLISHED 1867 • H. W. MONS, President • W. L. DITFURTH, Vice-President • T. H. PRICE, Secretary

UNION SPECIAL MACHINE CO., largest industrial sewing machine manufacturer, has Hill-Clarke machines still in use after 33 years. J. V. CARLSON, Chief Factory Supt. says "We find Hill-Clarke the most reliable dealer in used machinery because of their years of experience plus their superior facilities for accurately rebuilding machine tools".

FOR YOUR PROTECTION only Hill-Clarke offers THIS 5 WAY GUARANTEE

1. A responsible organization—82 years experience.
2. A 58,000 sq. ft. plant equipped with complete and modern facilities plus experienced craftsmen for remanufacturing machine tools.
3. Modern machines—no worn out equipment.
4. You can see your machine tested under power before purchasing.
5. Hill-Clarke's unconditional money-back guarantee.

AUTOMATICS

No. 2 Brown and Sharpe
1⅝" Greenlee, 6 Spdls. (1941)
No. 61 New Britain 6 Spdls. 1⅝" (1942)
No. 6 Brown & Sharpe
No. 49 New Britain, 4 Spdl. chucker
Model A 2½ Cleveland
Model A 3¾" Cleveland

DRILLS

No. 150 Baker
No. D8 Colburn No. 6 Morse Taper
No. 1LMS—20"—5 Spdl. Leland-Gifford
No. 2LMS—26"—1 Spdl. Leland-Gifford
No. 2LMS—14"—3 Spdl. Leland-Gifford
No. 2LMS—26"—4 Spdl. Leland-Gifford
No. 2LMS—26"—6 Spdl. Leland-Gifford
No. 4BL Natco 36 Spdls.
6'-17" Col. Fosdick Radial
7'-15" Col. American Full Universal

GEAR MACHINES

No. 61-A Fellows Gear Shaper
No. 61-A Fellows Gear Shaper (1942)
No. 7125 Fellows (1943)
No. 712 Fellows Auto Indexing (1943)
No. 72 Fellows Gear Shaper
No. 16 HS Gould & Eberhardt
No. 18H Gould & Eberhardt
No. 6 Gleason Gear Tester
12" Gleason Bevel Gear Cutter
72" Cincinnati Gear Cutter

HORIZONTAL BORING MILLS

No. 31 Lucas 3" bar
No. 46-B Heald Bore-Matic
No. 112—C Excello 2 Spdl.

GRINDERS

3"x12" Brown & Sharpe No. 5
4"x12" Landis, Model H (1942)
6"x18" Norton Type C Plain (1943)
6"x30" Norton Type C Plain (1943)
10"x18" Norton Type C Plain (1943)
10"—14"x36" Norton Type C Plain (1942)
10"x48" Norton Type C Plain (1943)
Norton Motorized Grinders ranging from 6"x 18" to 24"x240"

No. 5—8"x24" Covel Hydr. Surf. (1941)
No. 36-A Hanchett Rotary Surface

72A-3 Heald Internal Grinder (1942)
72A-5 Heald Internal Grinder (1942)
74 Heald Internal Gdr. (1942)
No. 5 Bryant Internal Grinder (1942)
No. 16-16 Bryant Internal Gdr. (1942)
No. 16-36 Bryant Internal Grinder (1942)
No. 24-26 Bryant Internal Grinder (1941)

LATHES

15"x5' Sebastian, Grd. Head
16"x54" centers LeBlond (1941)
16" x 60" centers Pratt & Whitney, Model E
18"x6' American, Grd. Head
19"-38" gap x 10' LeBlond
36"x30' Lodge & Shipley
38"—48"x16' Lehman Hydratrol (1945)
48"x20' centers Simmons (1942)
50"x17' centers LeBlond (1942)

LATHES (Production)

8"x15" Sundstrand, Model D (1943)
10"x16" Sundstrand
10"x22" Sundstrand, Model AA (1943)
16"x33" Fay Automatic (1942)
20"x25" Fay Automatics (1942)
R—14 Seneca Falls Lo-Swing

MILLING MACHINES

No. 4 Cincinnati Plain (1943)
No. 2 H Milwaukee Vertical
No. 2 Cincinnati Vert. (1942)
No. 2M Cincinnati Vert. (1941)
No. 3 Cincinnati H.P. Vertical
No. 1-18 Cinn. Mfg. (1940)
No. 2—18" Sundstrand-Electromil (1942)
No. M-24 Milwaukee Simplex (1942)
38"x40"x10' Fitchburg Duplex Miller (1943)
No. 4-48 Cincinnati Hyd. Tracer (1942)
No. 34-48 Cincinnati Hyd. Duplex
No. 45-48 Cinn. Hyd. Plain Tracer (1942)
No. 46-72 Cincinnati Plain Hyd. (1942)
No. 56-72 Cincinnati Plain Hyd. (1941)
4"x9" Hanson-Whitney Univ. Thrd. Miller
4½"x12" Pratt & Whitney, Model C
6"x36" Lees-Bradner—Model HT (1943)
6"x48" Pratt & Whitney Thrd. Miller
6"x80" Pratt & Whitney Thread Miller
6"x132" Pratt & Whitney Thread Miller
6"x168" Pratt & Whitney Thread Miller
10"x48" Hanson-Whitney Thread Miller
24"x24"x12' Ingersoll Adj. Rail
36"x36"x16' Ingersoll Slab Miller
No. 10 Ingersoll 72"x6' Traveling Col. Face Millers (1942)

MISCELLANEOUS

18" Dill Slotter
Model H-7 Micromatic Hydro Honer
Model H-2 Micromatic Hydro Honer
Model 200 Micromatic Hydro Honer
8-M Wells Band Saw
Model H-100 Micromatic Hydro Honer
Model 200—H5 Micromatic Horiz. Hone.
No. 2 V & O open back press
5aush Radial Tapper (1942)

PLANERS

36"x36"x12' Cincinnati
36"x36"x18' Gray, 4 Heads
48"x36"x14' Gray
48"x48"x12' Cincinnati, 4 Heads

TURRET LATHES

No. 3 Jones & Lamson Bar Feed
No. 4 Gisholt Universal Turret Lathe
No. 4R Libby, Bar Feed
No. H-5 Libby
No. 5 Bardons & Olivers (1942)
No. 5 Midland, Bar Feed
No. 2-A Warner & Swasey
No. 1-H Libby, 6¼ Hole in Spindle
No. 1-H Libby, Extra Long Bed (1942)
18" Libby, 3½" Hole in Spindle
No. 4A Warner & Swasey, 7½" Hole in Spindle

VERTICAL BORING MILLS

42" Bullard New Era
42" Colburn
60" Colburn
72" Niles Extra Heavy
84" Betts

FEATURE OF THE MONTH

For handling large milling work 38"x40"x10' Fitchburg Duplex Milling Machine. New in 1943. Excellent condition.

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MACHINE TOOLS

BORING MILLS—Horizontal
CINCINNATI GILBERT 3½" bar, floor type, latest
DETRICK & HARVEY 4" bar, Floor Type, M.D.
GIDDINGS & LEWIS #22T, 2½" Bar—latest
GIDDINGS & LEWIS #45, 5" Bar, Table Type, latest
LUCAS #41, 3" bar, Table Type, Latest Type
NILES-BEMENT-POND 5", 6", 8", bar, fl. type, M.D.
UNIVERSAL 3" bar, high speed, latest type

BORING MILLS—Vertical
BETTS 120", 2 swivel heads, AC. Motor Drive
BULLARD 16", 6 spindle Multaumatic, Latest Type
BULLARD 24", 36", 54", "Spiral Drive"—latest
BULLARD 61" "Maxi-Miller," 2 heads, Motor Drive
COLBURN 72", 2 swivel heads, PRT, M.D.
KING 62", 2 swivel heads, PRT, M.D.
NILES 100", 2 swivel heads, PRT, DC, M.D.

DRILLS
AMERICAN 3' arm 9" column, "Hole Wizard," latest
AMERICAN 4' arm 11" column, "Hole Wizard", latest
LELAND & GIFFORD #1LMS, 4 spindle, latest
LELAND & GIFFORD #2LMS, 6 spindle, latest

GEAR CUTTING EQUIPMENT
FELLOWS #61, #7, #7A, #72, #75, #77 High Speed Gear Shapers, latest type
FELLOWS #Z, #6Z2, Gear Shaper, latest
GLEASON 5", 12" straight bevel generator, Latest
GOULD & EBERHARDT #12H, Hobber, Latest
GOULD & EBERHARDT #36H, Hobber, with diff., M.D.
PRATT & WHITNEY 10" Grinder, hyd., latest

GRINDERS—Cyl.—Plain & Univ.
BROWN & SHARPE #1, 2, 3, Plain Universal, Latest
BROWN & SHARPE #20, 10 x 18 plain, latest type
LANDIS 8x12, 4x18, Type B Plain Hyd., Latest
NORTON 6x18", 10x32", 14x36", Type C, Plain, latest
NORTON 6"x30" type C, Plain Hydr., Latest

GRINDERS—Miscellaneous
BRYANT #16-CP-16, #24 Int. Hyd., latest
CINCINNATI #2 Centerless "Filmatic," latest
CINCINNATI Centerless Lapper, Model ED, Latest
COVEL #22 Universal Tool & Cutter, Latest Type
HEALD #72A3, 72A5 "Gazematic," Internal, Latest
HEALD 73A, 72A3, 72A5, 74, 70A Internal, latest
LANDIS #12 Centerless, latest type

GRINDERS—Surface
HANCHETT Series 300, 12x48" Vert. spdl. hyd., latest
HEALD #22 Rotary, 12" chuck, latest type
HEALD #5A—rotary—16" and 36" chuck, hyd., latest
THOMPSON 12x12x24 Type D Hyd., Latest Type
THOMPSON 12x12x40 Type D Hyd., Latest Type

LATHES—Engine & Mfg.
AMERICAN 16"x36" centers, 2 carriages, motor dr.
LEHMANN 16x30" centers, TIMKEN, latest type
LoSWING 4x60, 4x84, 8x60, 8x108, 5x54, Latest
MONARCH 12"x54" centers, Timken, Latest Type
MONARCH 16"x20" centers, Model EE, Timken, latest
MONARCH 16"x32" centers, Timken, Latest type
MONARCH 22"x456" centers, 3 carriage, Timken Bearing, motor drive
NILES 30x50" Boring, Timken, Latest Type
PRATT & WHITNEY 16"x60" centers, taper att., M.D.
SPRINGFIELD 60"x30" centers, Timken, Latest Type
WARD, HAGGAS & SMITH—18/36x60" centers gap.

LATHES—Turret
BARDONS & OLIVER #5, #7, Timken, Latest Type
FOSTER #4FU "Fastermatic" Timken, Latest
GISHOLT #1L, #2L, Universal, Timken, Latest
GISHOLT #3, #4 Univ., TIMKEN, Latest Type
JONES & LAMSON #4, #5 Univ., Timken, Latest
LIBBEY "International" 1-B5, Univ., Timken, latest
MOREY No. 2G, No. 3, No. 4, Timken Bearing, latest
POTTER & JOHNSTON #5D, 2"-IDE, Timken, latest
WARNER & SWASEY #1, 2, 3, Ram—Timken, latest
WARNER & SWASEY #2A Universal, Timken, Bar & Chucking, Latest Type (Preselector)

MILLING MACHINES—Plain
BROWN & SHARPE #2, Light Type, Timken, latest
BROWN & SHARPE 2B, 3B, Timken, Latest Type
CINCINNATI 0-S Automatic, Latest Type
CINCINNATI #4 TIMKEN, Motor Drive
CINCINNATI 4-36, 2-18 Hydromatic, Simplex, latest
KEARNEY & TRECKER 2H, 3H, 4H, Timken, latest
KEARNEY & TRECKER #3, 4, Hyd., Timken, M.D.
KEMPSMITH #2G, Timken, latest type
KEMPSMITH #4 Maximiller, Timken, latest type

MILLING MACHINES—Vertical
BROWN & SHARPE #2, Timken, latest type
CINCINNATI #2, #4 Dial Type, Timken, latest
GORTON #8½D, 9J high speed, latest
REED PRENTICE 3VG, with duplicator, Latest

SCREW MACHINES—Automatic
BROWN & SHARPE #2G High Speed, Latest Type
CLEVELAND 9/16" model A, high speed, latest type
CONOMATIC 6", 4 spindle, latest type
CONOMATIC 2½"—4 spindle, Latest Type
GOSS & DeLEEUW 8" auto. Chucker, 5 spin., latest

MISCELLANEOUS
AJAX 1½", 2", 3½" Forging and Upsetting, M.D.
BARNES #17Z, 306H, 307 Vertical Hone, Hydraulic, Self-Oiling, Latest Type
CINCINNATI 1-36, 3-30 Duplex Vert. Surface Broach, Double ram, Model ER, Hyd. Latest Type
FOSDICK Model 42 Jig Borer latest type
LAKE ERIE 500 ton Vertical Hydraulic Press, latest
MICHIGAN #1708A Cutter Reliever, Latest Type
PRATT & WHITNEY (KELLER) Type BL-2416 & Type G Copying, latest type, 2 & 3 Dimensional
PRATT & WHITNEY ½-6x60 Hiller, Latest Type
PRATT & WHITNEY 6 x 60 Thread Miller, latest
QUICKWORK ⅝" x 1" cap. Rotary Shear—M.D.

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BORING MILLS
Defiance #25A—3½" Bar Table Type—extra vertical and cross range (late).
Universal 4" Bar "Triway" Table Type — extra vertical range (late).
Bullard 24" and 36" Spiral Drive. Also New Era type.

GRINDERS
Gallmeyer & Livingston #25—6"x18", #15—12"x24" and #3—10"x36" Hydraulic Surface, mag. chuck, wet grinding (all late type).
Blanchard #11 Rotary Surface—16" chuck (late).
Brown & Sharpe #2 Univ. Cylindrical (late).

Gorton 3G Pantegraph Machine—3 dimensional Div. Hds.—cabinet and accessories.

DRILLS
Footburt #3—12" 6 spindle Power Feed Drilling Machine (equal to new)
Americon 3' 9" Hole Wizard Radial, 12 speed.
Cinn.-Bickford 4' 9" Super Service Radial, Mono-Arm control

SHAPERS
Hendey 12" Univ. Timken Bearing (late).
Cinn. 16" Univ. (late).
Gould & Eberhardt 24" Dbl. Train Gear Drive "Invincible."
Hendey 32" Crank M.D. Timken Bearing.

MILLERS
2—Pratt & Whitney #1—½B Jig Borers, rotary table, collets, measuring rods, gauges.

Van Norman 36SU Univ. (late).
Brown & Sharpe #2 light type vertical.
Milwaukee #2K High Speed Vertical.

LATHES
Sundstrand #8—15" and #10—22" Automatic Stub.
Pratt & Whitney 16"x36" Model B.
Reed Prentice 16"x48" Model B 54" C. Dist. 1942.

PRESSES
Toledo #59—250 ton S.S. 18" stroke 4 Pc. tie rod constr.
Farquhar 100 ton Hydraulic 36" stroke (late).
Billings & Spencer #2 Trimming—side shear.

HAMMERS & FORGING MACHINES
Standard 1200 lb. Board Drop—1942.
Chambersburg 2500 & 4000 lb. Board Drop.
National 3", 5", 7½" Upset Forging Mach.

AUTOMATIC SCREW & CHUCKING MACHINES
Brown & Sharpe #00G, 0G, 2G High Speed (late).
National RA 9 16—6 spindle auto. (late).
Acme Gridley RG—2⅝" auto.—Tooling.
Potter & Johnston 6DRE Auto, Chucking—timken bearing.

MISCELLANEOUS
Woodward-Powell 48"x48"x14" Dbl. Housing 4 hds. —Reversible M.D.
Gorton 9J duplicating machine—collet, cabinets and tooling.
Do-All 36" Throat Contour Machine.

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¼"x10' Mild Steel
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Roller Type Slab Miller 22" Slab capacity
12 Spindle Molins Automatic Drilling Machine
3 spindle Molins Model 7-D Cylinder Borer
1 -A W&S Universal Turret Lathe
30" x 14' Schumacher & Boye Engine Lathe
Libby 26" x 4½" spindle Turret Lathe
#33 ExCello Thread Grinder
Lees Bradner CT 36" Thread Millers
10" x 48" Roll Grinder
300' Air Compressor, Ingersoll Rand, 50 HP Motor Drive.

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BENNETT SPECIALS

36" Bullard Mill, Spiral Dr., 4 Jaw
4" bar Universal Table Type Mill, 60" spin. to table, 96" spin. to outer support, '42.
3" bar Yoder, Table Type Hor. Mill, 30" spin. to tble., 72" spin. to outer support
48"x20' centers N.B.P. Lathe, Grd. Hd.
36"x32" bed Niles Lathe, 2 carr., T.A.
No. 4 Gisholt Univ. Turret Lathe, 1942
2¾" Acme Gridley RB8, Automatic, 8 spin.
1⅛" Conomatic, 8 spin. (4)
36"x36"x12' Cinci. Hypro Planer, 4 hds., Var. Voltage, 1943
42" & 36" King, Side Hd., (2) '43
2½" bar #25T G & L Table, '43
16"/18¼"x54" cc Reed Pr., 1942
3' Foadick 11" col., late, 1943
#65 New Britain Gridley, 6 spin., '43
#36 Van Norman Miller, 1944
ML16 Duall Saw, late
#174 Heald Gap Int. Grinder
#26Y28 Bryant Int. Grinder
4'13" Coll. Bickford Radial, Late
28/60 Cinci. Hydrotel Mill, 1 spin.
#3 Cinci. Dial Miller, H.S.
#3H K & T Millers (2) Late
#2MH Cinci. Millers (2) Late
#1-18 Cinci. Millers (2) Late
4 Spin. Cinci. 360 deg. Auto Profiler
4" Oster #704 Pipe Threader, M.D.
12"x24" G & L #45 Surface Grinder
#3 and #1A W & S Turret

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MODERN TOOLS

1—Farrell 2 wheel Roller Grinder, M.D.
1—Marvel #4B Hacksaw, M.D.
1—3 ft. Morris Mor-Speed Radial Drill, M.D.
1—Cincinnati #2 Milling Machine, M.D.
1—14"x6" Hendey Lathe, M.D.

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2⅝" RA-6 NATIONAL ACME

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INDUSTRIAL CHILLING MACHINE
DEEP FREEZE CASCADE—120 F. Height 38", Length 82", Width 32¼", Approximately 7½ cubic feet, WITH 2 MOTORS, ½ and ¾ HP, 3/60/220. PRICE $850.00

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2—Lodge & Shipley Duomatic lathes
2—Potter & Johnston #5 DE Chucking machines
1—D. E. Whiton #16 gear cutter
1—Monarch Lathe, 22 x 48"
1—3 spindle Gould & Eberhardt spur gear and bevel rougher
1—Heald double spindle Borematic

SIER-BATH GEAR & PUMP CO., INC.
9252 Hudson Boulevard, North Bergen, N. J.

MODERN
used and rebuilt
MACHINE TOOLS

AUTOMATICS

6" RPA-8 Acme Gridley Chucker. Latest.
16" Bullard Mult-Au-Matic, 6 spdl. 1942.
6" Goss & DeLeeuw Chucker, 8 spdl. 1943.
1⅝" Greenlee, 6 spindle. 1942.
No. 1½ B-18 Cleveland. 1940.
No. 60 New Britain, 6 spdl. 1942.
9/16" RA-6 National Acme. 1942.
9/16" RA-6 Acme Gridley Chucker. 1942.
Model 3-8 Ceco, ⅜" cap. Late.

BORING MACHINES

No. 42 Lucas Horiz. 4" bar. 1940.
Yoder Horiz. Boring Mill 3" bar. 1942.
No. 46B Heald "Bore-Matic" Double End. 1940.
No. 49 Heald "Bore-Matic" Double End. 1942.
No. 49 Heald "Bore-Matic" Single End. 1942.
No. 47A Heald "Bore-Matic" Single End. 1942.
No. 2112A Excello Single End. 1943.

BROACHES

No. SRV 40-66 Lapointe Vert. Surface. 1942.
No. V-2 American Vertical. 1943.
No. CPC 6-30 Lapointe Vertical. 1941.
Model XA Oilgear Horizontal, 48" stroke

DRILLS, HEAVY DUTY

25" Fosdick Economax 1941.
No. 121 Baker Upright. Late.
21" Canedy Otto. Like New.
No. 40 Fox Multiple Spindle. 1944.
No. 3 Bausch Multiple Spindle.
Barnes 2 Spindle Deep Hole. 1943.
No. ⅛Bx50 P&W Deep Hole Drill. Late
No. ½Bx50 P&W Deep Hole Reamer. Late.
No. ½Bx30 P&W Deep Hole Reamer. Late.
No. ¼Vx50 P&W Deep Hole Riffer. Late.

DRILLS, RADIAL

6' 17" Carlton. 1942.
Bausch Comb. Drill & Tapper. Late.
3' Leland Gifford Tapper. 1941.
20" Pfiffner Drillmaster. 1942.

DRILLS, SENSITIVE

20" Walker Turner, 6 Spindle. 1942.
No. KH2 Allen, 6 Spindle. 1943.
16" Atlas, 4 Spindle. 1942.
15" Atlas, 4 Spindle. 1942.
14" Delta, 4 Spindle. 1942.
No. 2 Motor-Avey, 3 Spindle. 1942.
No. 2 MS Allen, 1 to 3 Spindle. 1942.
No. 2 Hamilton-Muehlmat. 1943.

GEAR EQUIPMENT

3" Gleason Bevel Gear Gen. 1942.
No. 140 Cleveland Rigidhobber. 1942.
Vinco Spline & Gear Grinder. 1942.
No. 7125A Fellows Gear Shaper. 1943.
No. 715 Fellows Gear Shaper. Late.
No. 712 Fellows Gear Shaper. 1942.
Type S Barber Colman Hobber. 1942.
12" Red Ring Internal Shaver. Late.
No. GCL-3 Red Ring Shaver. 1942.
No. 860B Michigan Finisher. Late.
15" Red Ring Lapper. 1942.
10" Red Ring Gear Speeder. Late.
Red Ring Universal Gear Checker. 1942.
No. 6 Gleason Tester. 1942.
No. 7 Gleason Revex Cutter Sharpener. 1942.
No. 12 Gleason Tool Sharpener. 1942.

GRINDERS, CYLINDRICAL

16"x36" Cincinnati Plain. 1942.
14"x36" Norton Type C Universal. 1943.
12"x48" Cincinnati Universal. 1943.
10"x72" Landis Type C Plain. 1942.
10"x24" Landis Type C Universal. 1942.
10"x18" Norton Type C Plain. 1942.
6"x30" Cincinnati Plain. 1943.
6"x24" Norton Plain. 1936.
6"x18" Cincinnati Plain. 1942.
6"x18" Landis Type C Plain. 1941.
6"x18" Norton Type C Plain. 1942.
4"x12" Landis Type H Plain. 1944.
No. 5 Brown & Sharpe Plain. Late.
No. 2 & 3 Cincinnati Centerless. 1942.

GRINDERS, INTERNAL

No. 16A22 Bryant Hydraulic. 1943.
No. 81 Heald "Sizematic. 1942.
No. 74 Heald Extended Bridge. 1941.
No. 75A Heald Two Motor. 1943.
No. 72A3 & A5 Heald Plain. 1944.
No. 50 Heald Plain. 1941.
No. 5 Bryant Internal. Late.
No. 104 Rivett Internal-External. 1943.

GRINDERS, SURFACE

16"x16"x48" Thompson Type C. 1943.
14"x36" Pratt & Whitney Vert. 1938.
6"x18" Robot. 1942.
No. 2B Reid. 1944.
No. 25A Heald Rotary. 1942.
No. 22 Heald Rotary. 1943.
A1-8 Arter Rotary. 1942.
6" Taft Pierce Rotary. Late.
72" Rogers Knife Grinder. Late.

GRINDERS, TOOL & CUTTER

No. 22 Covel Universal. 1942.
No. 4T Sellers Carbide. 1942.
Barber Colman Comb. HRS. 1943.
No. 91A Covel Universal. 1942.
No. 2 LeBlonde. Late.
No. 13 Brown & Sharpe Universal.
No. 44 & 48 Excello Carbide. 1942.
Milwaukee Face Mill. 1942.
No. P5 Bura-Way Carbide. 1942.

LATHES, ENGINE

24"x168" Sidney. 1940.
18"x54" Lodge & Shipley. 1943.
18"x48" Bradford. 1942.
16"x30" American "Pacemaker". 1944.
16"x8' South Bend, c.d. 1944.
14"x78" Reed Prentice. 1942.
14"x54" Reed Prentice. 1942.
14"x30" Lodge & Shipley. 1943.
14"x6' Hendey.
14"x6' Reed Prentice.

LATHES, PRODUCTION

20"x25" Fay Automatic. 1942.
14"x42" Monarch "Magna-Matic". 1941.
12"x18" Lipe "Carbo". Latest.
10"x21" Sundstrand, Model 10. 1942.
9"x20" Lipe High Speed. 1942.
8"x36" Lo-Swing Semi-Auto. 1942.
8"x21" Fay Automatic. 1942.
8"x15" Sundstrand, Model 8. 1942.
Model 1MR & R Lo-Swing. 1942.

LATHES, TURRET

No. 3A Warner & Swasey. 1943.
No. 9A Jones & Lamson. 1942.
No. 3L Gisholt. 1941.
No. 2FU Foster "Fastermatic". 1943.
No. 2L Gisholt. 1942.
No. 1A Warner & Swasey. 1943.
No. 1 Acme Universal. 1941.
No. 8½"x24" Acme Universal. 1943.
No. 2, 3, 4 & 5 Warner & Swasey. 1942.
No. 2, 3 & 7 Bardons & Oliver. 1943.
No. 3 & 4 Gisholt. 1943.
No. 4 Midland. Late.
No. 2A Warner & Swasey.

MILLING MACHINES, PLAIN

No. 3B Brown & Sharpe. 1941.
No. 3 Van Norman. 1942.
No. 2 Cincinnati Dial Type. 1942.
No. 2H Milwaukee. Late.
No. 2HL Milwaukee. 1942.
No. 2L Van Norman. 1942.
No. 2B Brown & Sharpe.
No. 3 Cincinnati.
Nichols Hand Mill. 1942.
No. 1M Kent Owens Hand. 1942.

MILLING MACHINES, PRODUCTION

No. BL-2420 P & W "Keller", 3 Spindle. 1942.
No. BL-2416 P & W "Keller", 1 Spindle. 1943.
No. BG-1 "Keller", Single Spindle.
No. 1248 Milwaukee "Simplex". 1942.
No. 4-48 Cincinnati Hydromatic. 1943.
No. 4-36 Cincinnati Hydromatic. 1942.
No. 2-18 Cincinnati, Rise & Fall. 1942.
No. 1-18 Cincinnati Plain. 1942.
No. 12 Brown & Sharpe. 1942.
No. 2-20 Kent Owens. 1942.
No. 1-14 Kent Owens. 1943.
No. 08 Cincinnati, Rise & Fall. 1942.
No. 08 Cincinnati, Plain. 1942.
No. MM-1-5-2 U.S. Multi-Miller. 1943.
No. MM-1-6 U.S. Multi-Miller. 1942.
No. 0, 00 & 2 Sundstrand "Rigidmil". 1943.

MILLING MACHINES, THREAD

6"x60" Pratt & Whitney. Late.
12"x54" Lees-Bradner. 1943.
8"x16" Hanson Whitney. Late.
4½"x12" Pratt & Whitney. 1942.
4"x9" Hanson Whitney. Late.

MILLING MACHINES, UNIVERSAL

No. 2 MH Cincinnati. 1942.
No. 2 H Milwaukee. 1942.
No. 2SU Van Norman. 1942.

MILLING MACHINES, VERTICAL

No. 2 Milwaukee, Model D. 1945.
No. 3K Milwaukee. 1942.
No. 3H Milwaukee. 1940.
No. 3 Cincinnati. 1942.
No. 2K Milwaukee. 1942.
No. 2 Cincinnati. 1940.
No. 2 Milwaukee.

MISCELLANEOUS

No. 35 Excello Univ. Thread Grinder. 1943.
6"x½" Bertsch Bending Roll. Late.
No. 405 Williams Turnings Crusher. 1943.
200 Lb. Bradley Helve Hammer. 1941.
1½" Landis "Landmaco" Threader, 2 head Late.
No. 7B High Speed Riveting Hammer. 1942.
Jones & Lamson Comparator. Late.
50 KVA Federal Spot Welder. 1942.
No. 616 Cleveland Rigidturner. Late.
No. 26F Norton "Hyprolap". 1942.
No. 1 Savage Roller Type Nibbler. New.
No. 3U Gorton Pantograph. Latest.

PLANERS & SHAPERS

52"x36"x40' Cincinnati Planer.
36"x36"x16' Ohio Planer.
12" New Haven Vertical Slotter.
6" Pratt & Whitney Vertical Shaper.

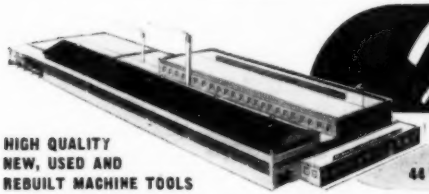
PRESSES

100 Ton Hannefin Hydraulic. 1942.
50 Ton Denison Hydraulic. Late.
45 Ton Reliance. 1942.
No. 8-6 Zeh & Hahnemann. 1942.

SAWS

14"x20" Racine "Shear-Cut". 1942.
13"x13" Peerless Universal. 1943.

ALL MACHINES MAY BE INSPECTED UNDER POWER IN OUR WAREHOUSE



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PRODUCTION EQUIPMENT

1—#12D Moline "Hole Hog" Drill Press—6½' Rail—12 Spdls. #5 M.T.
1—#2 Ajax Steel Frame—Hi Speed Bulldozer—M.D.
1—#4 Williams-White Hi Speed Bulldozer
1—1½" Landis "Landmaco" Threader—2 Spdl. —Lead Screws—Latest Style

1—Bradley Hammer 100# Helve Type Rebuilt—New Rubbers and Anvil Block—Like New Condition

1—⅞" Landis 1 Spdl. Threader—Lead Screws —Lanco Hd.—Latest
1—1" Landis "Landmaco" Threader—1 Spdl. W/O L.S.—Latest Style
1—2" B&K "Landis Head" Pipe Threader—M.D. Thru Gear Box
1—4" B&K "Landis Head" Pipe Threader—M.D. Thru Gear Box
1—2½" Hill Acme 2 Sp. Lead Screw Threading Machine Model XL—Late

1—#1½ National High Speed Forging Maxipress—1940

BOLT MACHINERY

1—Kingsbury 4 Sp. Pin Drilling Machine with burring attachments—1942
1—#00 W.F Hi Spd. SSSD Header—275 Blanks per minute
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1—#1 Manville DSSD Header—Rebuilt—M.D.
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1—#625 C Manville 5/8" Hi Spd. Trimmer
2—#2C Manville Slotters—Motor in base
1—#0 Ajax Hogue Wire Drawer

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1—#0612 Pexto Universal Beader
2—Edlund #1B Drill Presses—M.D.—New
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1—4" Bignall & Keeler Pipe Cutoff Mch.
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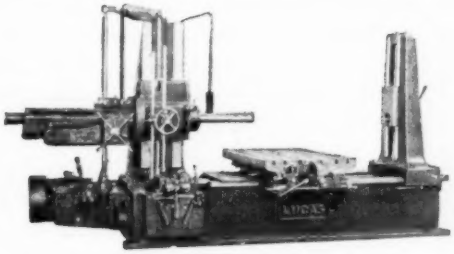

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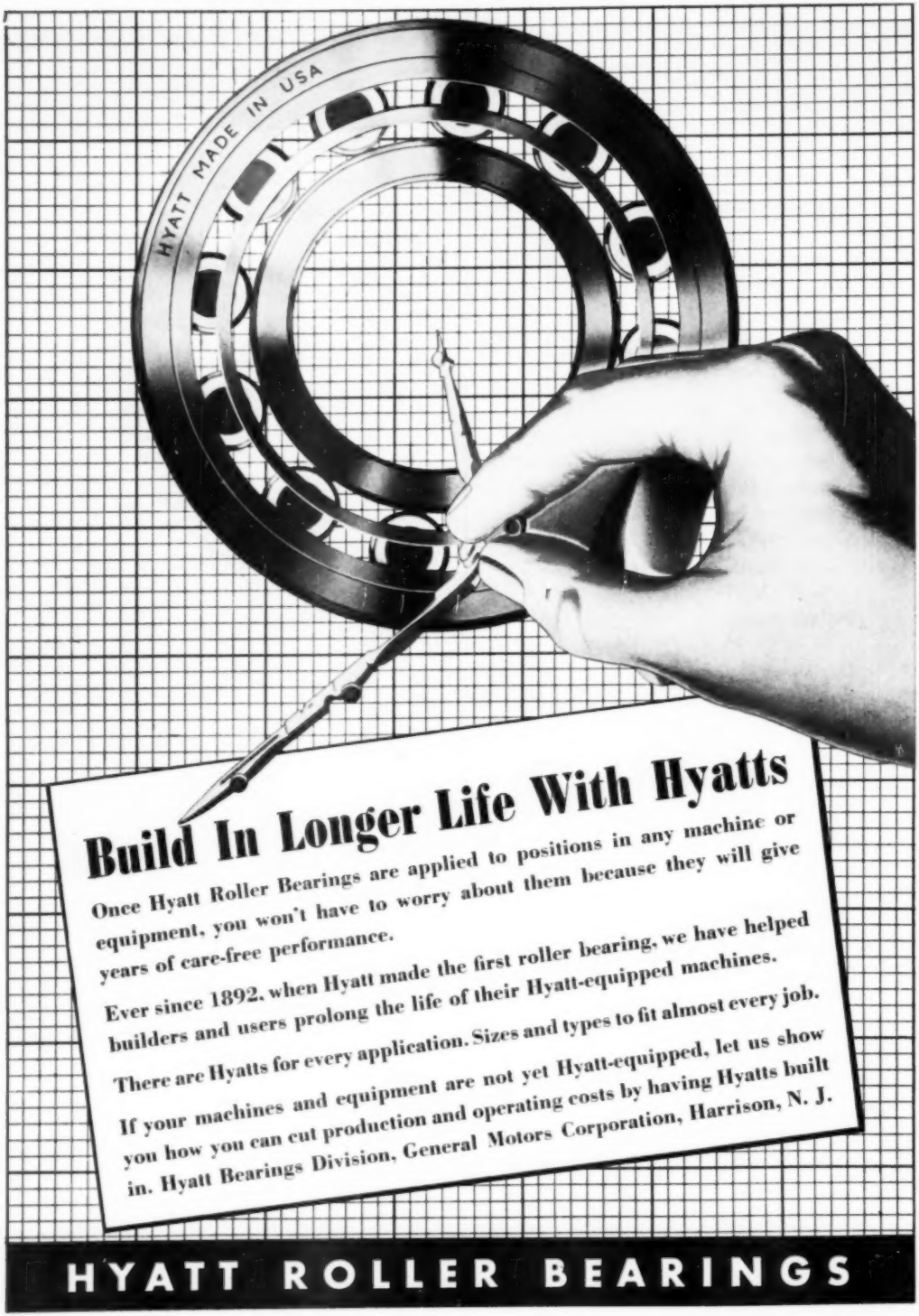

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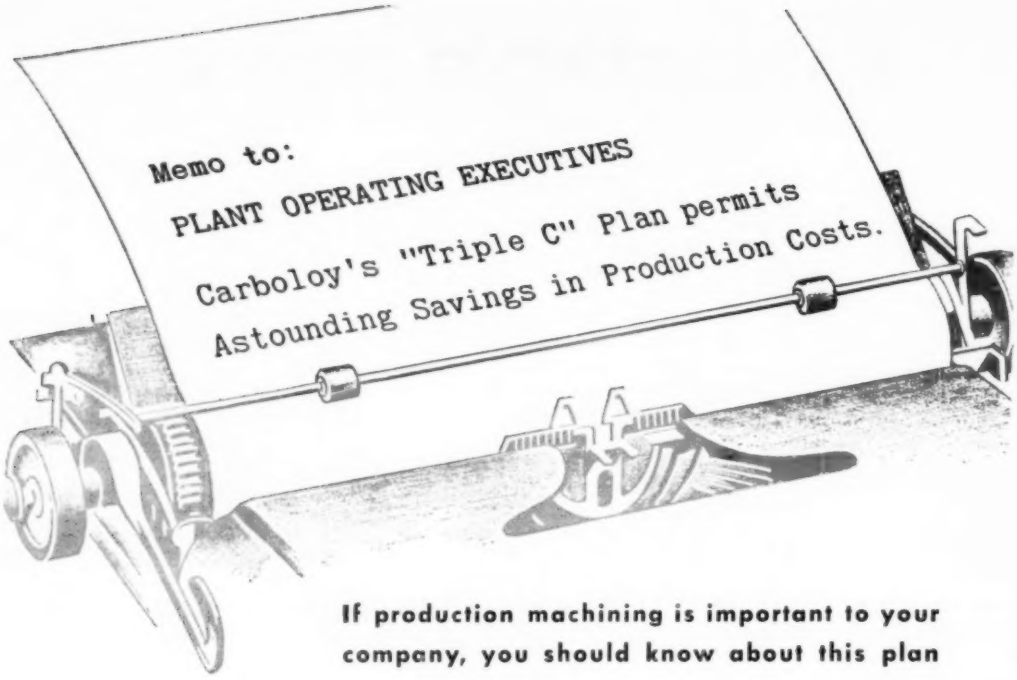

If production machining is important to your company, you should know about this plan

CARBOLOY COMPANY'S plan of Coordinated Carbide Control ("Triple C") goes far beyond merely realizing savings in tool costs through the use of cemented carbides.

It is actually a carefully developed program that can substantially reduce manufacturing costs, increase production and eliminate waste of time and materials. It can do much to help lower your company's break-even point in these days of high fixed and variable costs.

This program deals with problems which are of vital concern to you, if machining is an important part of your company's production. It offers a *quick and sure* way to effect major savings strictly within the production area.

"Triple C" is field-tested and workable

Simply defined, "Triple C" is a plan, based on years of field experience, for coordinating all phases of carbide tool use in your plant. Wherever the program has been put into operation, it has achieved amazing results . . . without increase in man-hours, without plant expansion or added major capital expenditure.

"Triple C" has worked for others. It can probably work as successfully for your company.

Here is a typical case

"The effect of rising costs in labor and raw materials has been substantially offset here by the application of carbide tooling on a coordinated plant-wide basis. Production savings realized by carbide-tipped cutting tools have been an important factor in helping to maintain product quality at current market prices."

—Large machine tool manufacturer

CARBOLOY COMPANY, INC.
11149 E. 8 Mile Street, Detroit 32, Michigan

CARBOLOY®
CEMENTED CARBIDE

THE CARBOLOY "TRIPLE C" PLAN
COORDINATED CARBIDE CONTROL
FOR EVEN GREATER SAVINGS WITH CARBIDES

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"PITTSBURGH" *Power Driven* BRUSHES

A Pittsburgh power-driven brush performing a washing operation in the Steel Mill at Crown Cork & Seal Company, Inc., Baltimore, Maryland.

On the job for...

CROWN CORK & SEAL

Pittsburgh's ability to cope with difficult brush problems solved a cleaning operation for Crown Cork & Seal Company, Inc. Oil film collected on the steel during the rolling process and had to be thoroughly removed before the steel was annealed.

Pittsburgh's skilled engineers studied the problem then designed a "built-up" brush roll of Tampico Sections. It was just the brush needed for the job . . . *stiff* enough to remove all oil and foreign matter . . . *soft* enough not to impair surface texture . . . *tough* enough to withstand the wear.

Whether your particular brush problem is cleaning, roughing, finishing or polishing— you can rely on the ingenuity of Pittsburgh's engineers to design a brush to do the job right. And Pittsburgh brushes will save you time and money!

There's a "Pittsburgh" Brush for Every Industrial Use!

- GLASS
- STEEL
- PLASTICS
- AUTOMOBILE
- RUBBER
- PAPER
- TIRE and RETREADING
- SHOE MANUFACTURING and REPAIRING

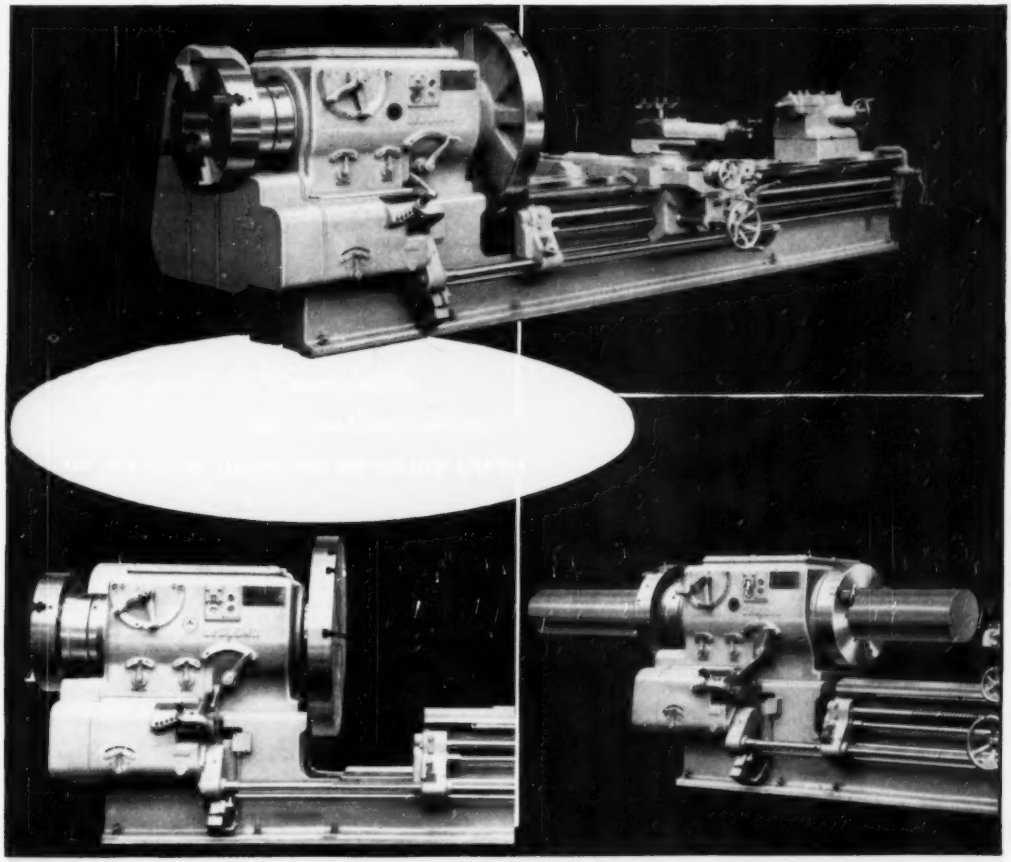
In the complete Pittsburgh line are brushes of all types, including "Perfect Balance" sections, wheels and assemblies. Consult the Pittsburgh engineering representative. He will gladly work with you in developing any type of power-driven brushes to meet your particular finishing specifications.

Phone or write Pittsburgh Plate Glass Company, Brush Division, 3221 Frederick Ave., Baltimore—29, Maryland

Power Driven BRUSHES

BRUSHES · PAINT · GLASS · CHEMICALS · PLASTICS

PITTSBURGH PLATE GLASS COMPANY



with adjustable gap . . . **. . . 12½" hole thru spindle**

The sliding bed gap-hollow spindle lathe, developed at the request of the metal-working industry, has just been completed. Another LeBlond first, it's the last word in versatile heavy duty metal turning with heretofore undreamed of flexibility and enormous capacity. It'll produce the work of a battery of lathes with just one investment . . . in the floor space of just one machine. This new LeBlond producer will be welcomed wherever a volume of work of various shapes and sizes must be turned quickly, easily, and at low cost. A glance at the specifications will convince you it's the lathe for you. Send today for complete information.

★ SPECIFICATIONS

Swing over bed and carriage wings	33½"
Swing over gap	60½"
Distance between centers—base length bed—closed	8' 0"
Distance between centers—base length bed—extended	13' 0"
Spindle hole, size	12½"
Spindle speeds, range, rpm	5 to 213
Motor recommended	25/12½-hp 1200/600 rpm

Built with totally enclosed, automatically lubricated quick change box. Hardened and ground steel bed ways furnished at no additional charge.

THE R. K. LEBLOND MACHINE TOOL CO., CINCINNATI 8, OHIO
LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES
NEW YORK 6, N. Y., Singer Bldg., 149 Broadway, COrtland 7-6621
CHICAGO 6, ILL., 20 N. Wacker Drive, STate 5561
PHILADELPHIA 40, PA., Beury Bldg., 3701 N. Broad, SAgamore 2-5900
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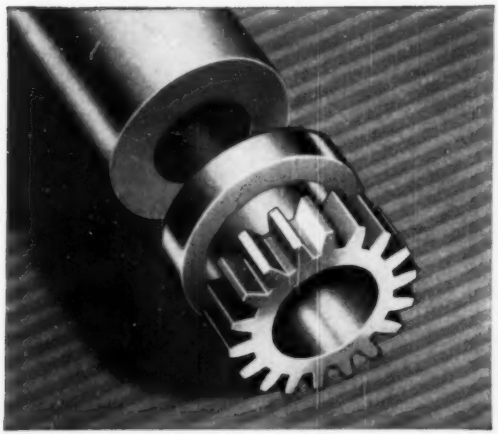
LEBLOND

Two ways TIMKEN® seamless tubing cuts costs on hollow parts



1. No hole to bore

The first step in production is already finished when you use Timken® seamless tubing instead of bar stock for making hollow or ring-shaped parts. There's no hole to bore, less waste stock to pay for. Elimination of drills on automatic machines often leaves space for other tools, sometimes speeding production as much as 200 per cent!

Timken seamless tubing offers you a range of sizes up to 10½" O. D., covering a wide variety of requirements. Rigid control throughout every step in manufacture results in steels of fine forged quality and refined grain structure, with uniform machinability and heat-treating. This means a better product for you, with fewer rejects and increased customer satisfaction.

2. TIMKEN® tube engineering service gives you the most economical tube size—guaranteed to clean up.

When you make use of Timken tube engineering service, you can be sure of minimum machining time—maximum saving of metal. That's because the Timken tube engineering service takes full responsibility for giving you the most economical tubing for your particular job—and guarantees that it will clean up to your dimensions. We take all the risk!

This guaranteed service is made possible by the outstanding uniformity of Timken tubing and by the largest assortment of roll sizes of any mechanical tubing mill in the country. Get details of this service now—without cost or obligation. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

Specialists in alloy steel—including hot rolled and cold finished alloy steel bars—a complete range of stainless, graphitic and standard tool analyses—and alloy and stainless seamless steel tubing